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Yadkin--Pee Dee River Basin North Carolina and South Carolina

ALTERNATIVES FOR CONSERVATION AND DEVELOPMENT

MAIN REPORT

1980

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This is the M he Yadkin-Pee Dee Cooperative River es the problems that were assigned for ches for solving problems, suggests ilized in carrying out alternatives a

Other reports d throughout the period of study. ific subjects that might be of greate he public. These reports are:

Report 1: Economic Base Study and Projections, October 1978
Report 2: Recreation Report by Fred Stewart, December 1978
Report 3: Water and Land Resources Inventory, October 1978
Report 4: Erosion and Sediment Inventory, December 1979
Report 5: Forest Resources, March 1980
Report 6: Environmental Resources Inventory, July 1980
Report 7: Potential Dam Site Inventory, August 1980
Report 8: Water Management Problems: Flooding, Wetness, Irrigation, December 1980

Copies of the reports may be acquired from the Soil Conservation Service, 1835 Assembly Street, Room 950, Columbia, South Carolina 29201.

24500

MAIN REPORT : #6

ALTERNATIVES FOR CONSERVATION AND DEVELOPMENT

Prepared as a part of the

YADKIN-PEE DEE RIVER BASIN COOPERATIVE STUDY,
North Carolina and South Carolina

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DECEMBER 1980

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SUMMARY AND RECOMMENDATIONS

Summary

This report presents alternative solutions to water and land resource problems that were identified in the course of study for the Yadkin-Pee Dee River Basin in North Carolina and South Carolina. The study was made under authority of Section 6 of Public Law 83-566 by agencies of the U.S. Department of Agriculture at the request of the Governors of North Carolina and South Carolina. The North Carolina Department of Natural Resources and Community Development and the South Carolina Water Resources Commission were appointed as lead agencies by their respective governors.

The purpose of the study is to provide information that will lead to the orderly development and conservation of the basin's water and related land resources. The information gathered in this study will be useful to the North Carolina Water Plan, the South Carolina Water Plan and the South Carolina Statewide River Basin Study. The scope of this study is restricted to agriculture and closely related problems. Eight (8) reports have already been printed. These are: Report 1 - Economic Base Study and Projections; Report 2 - Recreation Report; Report 3 - Water and Land Resources Inventory; Report 4 - Erosion and Sediment Inventory; Report 5 - Forest Resources; Report 6 - Environmental Resources Inventory; Report 7 - Potential Dam Site Inventory; and Report 8 - Water Management Problems: Flooding, Wetness, Irrigation.

The Yadkin-Pee Dee River Basin encompasses all the land that drains into Winyah Bay at Georgetown, South Carolina. See Vicinity Map, Figure IN-1. Five Major Land Resource Areas comprise the basin -- the Blue Ridge, Southern Piedmont, Carolina and Georgia Sand Hills, Southern Coastal Plain and the Atlantic Coast Flatwoods[1/]. Fifty-seven (57) percent of the 11,770,910 acre basin is in North Carolina, 43 percent is in South Carolina and less than one percent is in Virginia. Table IN-1 shows present land use.

Major problems addressed by the study are soil erosion and related sediment; loss of natural resources such as prime farmland and prime forest land, wetlands, and historical and archeological sites; losses from droughts, flooding, and wetness; future shortage of wood fiber; shortage of water storage and undeveloped recreational resources.

All studies were closely coordinated with the North Carolina Department of Natural Resources and Community Development and the South Carolina Water Resources Commission. Each of these agencies provides leadership for water resource development in their respective states. The study was also closely coordinated with the "Level B" study funded by the U.S. Water Resources Council for the same area.

1/ Recently, the Atlantic Coast Flatwoods Major Land Resource Area has been subdivided to form a sixth major land resource area called the "Tidewater Area" which is a strip of land along the coast with elevations up to 25 feet mean sea level.

This report offers three alternatives for natural resource development and protection. The first alternative assumes a future wherein state and federal programs will continue at current levels. This alternative is referred to as the "future without" condition. The second alternative considers economic development as a single goal and is referred to as economic development (ED). The third alternative approaches resource development principally to maintain environmental quality (EQ). Given the nature and extent of problems and concerns in each of the states, the final or recommended alternative, developed with guidance from public and private viewpoints, is offered as the most practical and expedient approach to protection and development of the basin's resources. Table S&R-1 presents elements of the preferred plan. Table S&R-2 presents opportunities for acceleration through USDA programs and attendant costs.

Recommendations

The recommendations are based on study findings. They were prepared with advice and guidance by state agencies. Table S&R-1 provides further details about some recommendations.

1. Accelerate treatment on 49,000 acres of cropland and pastureland, 7,000 acres of forest land, and 5,000 acres of critical areas each year for the next ten years. Identify and treat most severely eroding land first. Treatment will be adequate to reduce soil loss to tolerable limits for long term productivity. This recommendation is directed to soil and water conservation districts, state agencies and USDA agencies. USDA would require additional funding for technical assistance and cost sharing. A greater input would be required from districts and state agencies for technical assistance and leadership. USDA favors the erosion control measures in the EQ Alternative because of the water quality improvement provided and maintenance of soil productivity which is needed in the long run despite the short run emphasis on resource use implied by current high interest rates and narrow profit margins. Recommendations for acceleration include such actions as demonstration land treatment projects, PL-566 land treatment projects and preferential treatment for low income farmers. This recommendation includes those features of the state plans for reducing nonpoint pollution.

2. Improve information program involving the protection of 1.3 million acres of wetlands, 1.8 million acres of prime farmland, 1.4 million acres of prime forest land, scenic views and archeological and historical sites presently available. This recommendation is directed to state and federal agencies. The states may wish to establish guidelines for protection of these resources. State and federal agencies should prepare and distribute maps showing locations of high value areas.

TABLE S&R-1: SUMMARY OF STUDY RECOMMENDATIONS

YADKIN-PEE DEE BASIN

Problems Component Needs Plan Elements	Present Condition Problems 1980	Future Condition Without Plan Component Needs 2000	Study Recommendations Component Need Met by 2000 Extent of Plan Element	Remaining Need by 2000
I. Soil Erosion and Resulting Sedimentation				
A. Reduction of Sheet and Rill Erosion	19.2 million tons/yr. loss	reduction in 16.4 million tons/yr. loss	3.4 million tons/yr. reduction	13.0 million tons/yr.
1. Adequately treat cropland and pastureland	744,000 acres not treated		49,000 ac./yr. for 10 years	
2. Improve site preparation methods on forest land	20,000 acres not treated		7,000 ac./yr. for 10 years	
B. Reduction in Critical Area Erosion	6.8 million tons/yr.	reduction in 5.6 million tons/yr. loss	1.8 million tons/yr. reduction	3.8 million tons/yr.
1. Treat gullies	60,000 acres active		200 ac./yr. for 10 years	
2. Stabilize roadbanks	266,000 acres eroding		800 ac./yr. for 10 years	
3. Stabilize logging roads and skid trails	2,000 ac./yr. disturbed		1,000 ac./yr. for 10 years	
4. Stabilize construction sites	9,000 ac./yr. disturbed		3,000 ac./yr. for 10 years	
II. Loss or Degradation of Resources				
A. Reduction in Loss of Prime and Important Farmland	1,700 ac./yr. loss	reduction in 2,000 ac./yr. loss	5,000 ac./yr. reduction in loss	1,500 ac./yr. loss
1. Improve land use planning			basinwide	
2. Use tax incentives			basinwide	
3. Identify and map prime and important farmland			basinwide	
B. Reduction in Loss of Prime Forest Land	2,500 ac./yr. loss	reduction in 3,000 ac./yr. loss	500 ac./yr. reduction in loss	2,500 ac./yr. loss
1. Improve land use planning			basinwide	
2. Use tax incentives			basinwide	
3. Identify and map prime forest land			basinwide	
C. Protection of Wetlands	800 ac./yr. loss	reduction of 900 ac./yr. loss	200 ac./yr. reduction in loss	700 ac./yr. loss
1. Protect wetlands during construction activities			1,800 sites/yr. for 20 years	
2. Improve land use planning			1,800 sites/yr. for 20 years	
3. Avoid development of wetlands			1,800 sites/yr. for 20 years	
D. Improvement in Visual Quality	1,700 ac./yr. changed	reduction of impacts on 2,000 ac./yr.	1,500 ac./yr. reduction in loss	500 ac./yr. loss
1. Improve land use planning			54,000 ac./yr. for 10 years	
2. Treatment of cropland and critical areas			54,000 ac./yr. for 10 years	
3. Improved forest harvesting methods			1,000 ac./yr. for 20 years	
4. Protect visual corridors			500 ac./yr. for 20 years	
E. Protection of Historical and Archeological Sites	loss not evaluated	needs not evaluated	not evaluated	not evaluated
1. Survey sites before construction			600 dam sites/yr. for 20 years	
2. Protect sites during construction			600 dam sites/yr. for 20 years	
3. Preserve or salvage sites			2 sites/yr. for 20 years	
III. Future Shortage of Wood Fiber				
Increased Production of Wood Fiber	no present shortage	increased production of 64.3 million cu.ft./yr.	64.3 million cu.ft./yr.	0
1. Planting trees	2 million acres understocked		55,000 ac./yr. for 20 years	
2. Timber stand improvement	0.5 million acres underproductive		5,000 ac./yr. for 20 years	
3. Reduction in insects, diseases and fires	15 million cu.ft. lost/yr.		4 million cu.ft./yr. for 20 years	
4. Salvage of wasted wood	40 million cu.ft. wasted/yr.		13 million cu.ft./yr. for 20 years	
IV. Frequent Yield and Income Loss Due to Drought				
Storage of Irrigation Water Construction of reservoirs	30,000 ac.ft. shortage shortage of 900 reservoirs	20,000 ac.ft. storage 580 reservoirs	20,000 ac.ft. storage 580 reservoirs	0
V. Frequent Crop Loss Due to Flooding and Wetness				
A. Reduce Floodwater Damages to Crops in Mountains and Piedmont	$3.9 million/yr. loss	$4.7 million/yr. reduction	$1.2 million/yr. reduction	$3.5 million/yr. loss
1. Change to less intensive land use			4,500 acres	
2. Floodwater retarding dams			23 dams	
3. Channel restoration			86 miles	
B. Reduce Wetness Problems in Coastal Plain	$27.1 million/yr. loss	$22.6 million/yr. reduction	$5.9 million/yr. reduction	$16.7 million/yr. loss
1. Change to less intensive land use			35,500 acres	
2. On-farm water management systems			280,000 acres	
3. Construct main channels			264 miles	
VI. Floodwater Damages to Nonagricultural Properties				
Reduce Floodwater Damages in Built-up Areas in Communities	154 communities suffer loss	damage reduction in 154 communities	some reduction in 154 communities	remaining losses not evaluated
1. Avoid future development in flood plain			154 communities	
2. Change land to less intensive use			500 acres	
3. Nonstructural measures			154 communities	
4. Construct main channels			16 miles	
5. Floodwater retarding dams			12 dams 1/	
6. Channel restoration			18 miles	
VII. Storage of Community Water Supplies				
Sites for Community Water Storage Construct reservoirs	2/	2/	3/	not evaluated
VIII. Undeveloped Recreational Resources				
A. Improved Fishing Opportunities	no present shortage	115,000 visitor-days/yr.	115,000 visitor-days/yr.	0
1. Improve farm pond management			1,200/yr.	
2. Develop stream access points			21 access points	
B. Improved Hunting Opportunities	no present shortage	82,000 visitor-days/yr.	82,000 visitor-days/yr.	0
1. Improve upland habitat			16,500 ac./yr. for 20 years	
2. Improve wetland habitat			3,500 ac./yr. for 20 years	
C. Purchase Additional Land and Develop Recreational Areas	4,700 acre shortage	14,000 acres	14,000 acres	
1. Land acquisition			14,000 acres	
2. Water-based recreational area			3 areas	

1/ Also included in VA2 above.
2/ See U.S. Water Resources Council "Level B" Study for municipal water supply needs.
3/ Report 7 (see front cover).

TABLE S&R-2: ANNUAL COST OF STUDY RECOMMENDATIONS

YADKIN-PEE DEE BASIN

Component Needs Plan Elements	Study Recommendations Extent	Annual Cost USDA 1/	Other 2/	Total
		($1,000)		
Reduction of Sheet and Rill Erosion				
Adequately treat cropland and pastureland	49,000 ac./yr.	765	600	1,365
Improve site preparation methods on forest land	7,000 ac./yr.	560	800	1,360
Reduction in Critical Area Erosion				
Treat gullies	200 ac./yr.	70	50	120
Stabilize roadbanks	800 ac./yr.	150	170	320
Stabilize logging roads and skid trails	1,000 ac./yr.	60	140	200
Stabilize construction sites	3,000 ac./yr.	70	530	600
Reduction in Loss of Prime and Important Farmland				
Improve land use planning	basinwide	5	20	25
Use tax incentives	basinwide	2	10	12
Identify and map prime and important farmland	4 counties/yr.	10	10	20
Reduction in Loss of Prime Forest Land				
Improve land use planning	basinwide	3	6	9
Use tax incentives	basinwide	2	4	6
Identify and map prime forest land	basinwide	4	4	8
Protection of Wetlands				
Protect wetlands during construction activities	1,800 sites/yr.	11	10	21
Improve land use planning	1,800 sites/yr.	5	10	15
Avoid development of wetlands	1,800 sites/yr.	7	10	17
Improvement in Visual Quality				
Improve land use planning	54,000 ac./yr.	6	4	10
Treatment of cropland and critical areas	54,000 ac./yr.			3/
Improved forest harvesting methods	1,000 ac./yr.	2	4	6
Protect visual corridors	500 ac./yr.	6	6	12
Protection of Historical and Archeological Sites				
Survey sites before construction	600 dam sites/yr.	4	1	5
Protect sites during construction	600 dam sites/yr.	4	1	5
Preserve or salvage sites	2 dam sites/yr.	1	2	3
Increased Production of Wood Fiber				
Planting trees	55,000 ac./yr.	1,688	900	2,488
Timber stand improvement	5,000 ac./yr.	592	600	1,192
Reduction in insects, diseases and fires	4 million cu.ft./yr.	121	200	321
Salvage of wasted wood	13 million cu.ft./yr.	61	200	261
Storage of Irrigation Water				
Construction of reservoirs	580 reservoirs	263	500	763
Reduce Floodwater Damages to Crops in Mountains and Piedmont				
Change to less intensive land use	4,500 acres	6	40	46
Floodwater retarding dams	23 dams	294	112	406
Channel restoration	86 miles	6	50	56
Reduce Wetness Problems in Coastal Plain				
Change to less intensive land use	35,000 acres	4	50	54
On-farm water management systems	280,000 acres	372	423	795
Construct main channels	86 miles	150	87	237
Reduce Floodwater Damages in Built-up Areas in Communities				
Avoid future development in flood plain	154 communities	3	6	9
Change land to less intensive use	500 acres	2	6	8
Nonstructural measures	154 communities	14	60	74
Construct main channels	16 miles	80	50	130
Floodwater retarding dams	12 dams	200	100	300
Channel restoration	18 miles	2	30	32
Sites for Community Water Storage				
Construct reservoirs	4/			
Improved Fishing Opportunities				
Improve farm pond management	1,200/yr.	6	150	156
Develop stream access points	21 access points	6	14	20
Improved Hunting Opportunities				
Improve upland habitat	16,500 ac./yr.	20	590	610
Improve wetland habitat	3,500 ac./yr.	4	181	185
Purchase Additional Land and Develop Recreational Areas				
Land acquisition	14,000 acres			5/
Water-based recreational area	3 areas	60	49	109

1/ See Table 3-1 for more information.
2/ Other funds include all except USDA. These could include individuals, local governments, state governments, or other federal funds.
3/ Costs included in erosion control above.
4/ See U.S. Water Resources Council, "Level B" Study.
5/ Cost not estimated.

3. Accelerate tree planting by 55,000 acres per year, timber stand improvement by 5,000 acres per year, protection of forests and salvage of 17 million cubic feet of wasted wood each year. This recommendation is directed to the state forestry agencies and others who provide planning assistance. A greater level of funding under the Agricultural Conservation Program (ACP) and the Forestry Incentives Program (FIP) as well as planning assistance will be required.

4. Accelerate construction of storage reservoirs for irrigation water to provide an increase of 20,000 acre feet of storage to be used to irrigate 20,000 acres by the year 2000. This recommendation is directed to the Soil Conservation Service (SCS) for technical assistance, Agricultural Stabilization and Conservation Service (ASCS) for financial assistance and state agencies and districts for program direction.

5. Make implementation studies including costs and returns on 24 potential watershed projects in the ED Alternative. Accelerate installation of projects and on-farm water management systems. On-farm systems include land forming, open ditches and tile drains. This recommendation is directed to soil and water conservation districts, state agencies and USDA. Districts and the state agencies should test the local interest in watershed projects, set priorities and provide direction. The SCS should provide planning assistance and construction funds for watershed project construction as local interests develop. The ASCS State Committee should reinstate cost-share assistance for on-farm water management systems where the potential damage to wetlands is low. The study team favors floodwater retarding structures and channel improvements in the ED Alternative because they contribute to the viability and strength of the agricultural sector and with careful design can retain and often enhance environmental quality.

6. Encourage maximum use of nonstructural measures for flood damage reduction in 154 communities. This recommendation is directed to local governments and councils of government, as well as federal agencies who assist in planning for flood damage reduction. Actions might include land use changes, flood plain studies, flood insurance, flood proofing, zoning, flood warning and other similar measures.

7. Encourage communities to use multiple purpose structures where feasible to store water for municipal and industrial use along with other beneficial uses. This recommendation

is directed primarily to councils of government and local governmental units.

8. Encourage resource planning agencies to include recreation as a purpose in all resource development plans.

9. Make a statewide water resources study for South Carolina. Concerns that have been identified during the Yadkin-Pee Dee Study that are of statewide importance in South Carolina are: (1) potential sites for water storage, (2) erosion and resulting sediment in lakes and ponds, (3) nonpoint sources of pollution in selected streams, (4) protection of wetlands, prime agricultural land and prime forest land, and (5) current and future impact of agricultural irrigation on water supplies. The statewide study should include acceleration of the resource inventories in the state.

INTRODUCTION

The Governors of North Carolina and South Carolina requested the United States Department of Agriculture to study land and water resource use within the Yadkin-Pee Dee River Basin located in central North Carolina and extending into northeastern South Carolina. Problems for study were initially identified by the South Carolina Water Resources Commission and the North Carolina Department of Natural Resources and Community Development. These problems and concerns were later reviewed through meetings with citizens advisory committees and state officials representing appropriate agencies. Two major objectives--economic development (ED) and environmental quality (EQ)--were focal points for resource management planning in the basin. This planning was designed to help set priorities for water and related land resource development, identify most urgently needed remedial programs and help determine priorities for technical and financial assistance.

The study was conducted under provisions of Section 6 of Public Law 83-566 by representatives of the Soil Conservation Service (SCS), the Economics and Statistics Service (ESS) and the Forest Service (FS), in cooperation with personnel from the States of North and South Carolina. A Field Advisory Committee (FAC) directed the study. The FAC was made up of the SCS State Conservationist in South Carolina as Chairman; the Leader of the Southeastern Section River Basin Branch, Natural Resource Economics Division, ESS as a member; and the FS Field Representative for the South Atlantic States as a member.

The purpose of the study is to provide information that will lead to the orderly development and conservation of the basin's water and related land resources. The scope of the study is restricted to agriculture and closely related problems.

A close working relationship has been maintained with those developing the U.S. Water Resources Council Comprehensive Study (Level B) for the same hydrologic area. The comprehensive study is using the agricultural and silvicultural information provided by this cooperative study to arrive at a recommended plan for the basin.

This report contains a summary of problems; an assessment of the future condition of the basin without accelerated programs and projects; an alternative emphasizing economic development of land and water resources in agriculture, silvicultural and recreational use; an alternative enhancing environmental quality; an assessment of opportunities for federal assistance in problem solving and recommendations for implementation. The report is not designed to provide all the information necessary for implementation of specific projects. It does, however, provide a framework of compatible actions that can be implemented as programs and resources become available and when local support is evident.

General Description of the Basin

The Yadkin-Pee Dee River Basin encompasses all the land that drains into Winyah Bay at Georgetown, South Carolina. Major watercourses are the Yadkin, Pee Dee (formed by the Yadkin and Uwharrie Rivers at the headwaters of Lake Tillery), Rocky, Lumber, South Yadkin, Little Pee Dee, Waccamaw,

Lynches and Black Rivers. (Figure IN-1.) The drainage area for the basin covers about 18,420 square miles; 43 percent of the area is in South Carolina and 57 percent in North Carolina. Five Major Land Resource Areas comprise the basin--the Blue Ridge, the Southern Piedmont, the Carolina and Georgia Sand Hills, the Southern Coastal Plain and the Atlantic Coast Flatwoods (Figure IN-1). Present use of the basin's land resources is shown in Table IN-1. (See pages 33, 40, 44, Table 8 and Figure 18 in Report 3.)

General Economy

Generally favorable economic conditions but with cyclical variations are projected. Population is projected to increase by about 43 percent between 1970 and 2000. Projections of total employment are tied to population projections. The proportion of the population in the work force within the basin is expected to increase from 39 percent in 1970 to about 42 percent in 2000. A higher proportion is projected for the North Carolina portion which has a higher level of industrialization and urbanization than the South Carolina portion. Projections of per capita income are also substantially above the 1970 levels. Projections of population, employment and per capita income for the basin and states are summarized in Table IN-2.

Low farm income is a continuing concern of the leaders of both states. The trend toward fewer but larger farms continues. During the 1969-74 inter-agricultural census period, the percentage of farms having gross agricultural sales of $10,000 or more increased throughout the basin. Yet in 1974, nearly 65 percent of all farms in the North Carolina portion of the basin had gross sales less than $10,000; 36 percent of all farms had sales totaling less than $2,500. During 1974 in the South Carolina portion of the basin, about 59 percent of all farms had gross sales less than $10,000; nearly 32 percent had less than $2,500[1/].

Estimated average income per farm in 1974 in the North Carolina portion was $5,500, substantially below the North Carolina statewide average of $7,300[2/]. Comparable income in the South Carolina portion was estimated at $9,500 considerably above the South Carolina statewide average of $5,600. The corresponding average per farm income across the southeast coastal area[3/] was $5,960 in 1974--similar to the South Carolina average, but 18 percent below the North Carolina level.

Agriculture

Historical trends in agricultural production are generally assumed to continue through 2000, but with some shifts in cropping patterns. Land treatment programs such as soil and water conservation district programs are assumed to remain at or near present levels. Crop yields will increase through advanced technology and improved management by farmers. However,

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1/ Report 1 (see front cover).

2/ Farm income is estimated as the market value of all agricultural products sold less total farm production expenses, as defined in the 1974 Census of Agriculture.

3/ Alabama, Florida, Georgia, North Carolina, South Carolina and Virginia.

130 Blue Ridge

136 Southern Piedmont

137 Carolina and Georgia Sand Hills

133 Southern Coastal Plain

153 Atlantic Coast Flatwoods

VICINITY MAP

FIGURE IN-1
MAJOR LAND RESOURCE AREA MAP
Yadkin-Pee Dee River Basin
NORTH CAROLINA, SOUTH CAROLINA AND VIRGINIA

APPROXIMATE SCALE MILES

COMPILED FROM USGS 1:500,000 STATE BASE MAPS,
LAMBERT CONFORMAL CONIC PROJECTION
GRID TICKS BASED ON NORTH CAROLINA
COORDINATE SYSTEM AND SOUTH CAROLINA
COORDINATE SYSTEM, NORTH ZONE

TABLE IN-1: HISTORICAL LAND USE

YADKIN-PEE DEE BASIN

	Cropland 1/	Pasture and Hay Land	Forest Land	Urban Land	Other Land Areas	Water Areas	Basin Area
NORTH CAROLINA							
Acres	1,519,490	490,880	3,929,100	387,980	321,430	95,400	6,744,280
Percent	22.5	7.3	58.2	5.8	4.8	1.8	100.0
SOUTH CAROLINA							
Acres	1,429,000	112,070	2,926,130	257,980	257,450	51,000	5,033,630
Percent	28.4	2.2	58.2	5.1	5.1	1.0	100.0
BASIN WIDE							
Acres	2,948,490	602,950	6,855,230	645,960	578,880	146,400	11,770,910
Percent	25.1	5.1	58.2	5.5	4.9	1.2	100.0

1/ Includes row crops, orchards, vineyards, idle cropland and water management systems on cropland.

SOURCE: Report 3 (see front cover).

TABLE IN-2: POPULATION, EMPLOYMENT, AND PER CAPITA INCOME FOR 1970 AND PROJECTIONS TO 2000

YADKIN-PEE DEE BASIN

	1970	2000
	(Thousands)	
Population		
North Carolina Portion	1,340.3	1,895.0
South Carolina Portion	558.8	814.8
Yadkin-Pee Dee Basin	1,899.1	2,709.8
Employment		
North Carolina Portion	548.4	838.0
South Carolina Portion	190.3	298.3
Yadkin-Pee Dee Basin	738.7	1,136.3
Per Capita Income 1/		
North Carolina Portion ($)	2.3	4.8
South Carolina Portion ($)	1.7	3.9
Yadkin-Pee Dee Basin ($)	2.1	4.6

1/ In terms of 1967 value dollars.
SOURCE: Report 1 (see front cover).

such increases will be partially offset by overall reductions in productivity as drainage systems deteriorate, soil erosion continues and some marginal lands are possibly converted to crop production. Differences in projected crop yields between the North Carolina and South Carolina portions are primarily due to differences in climate and characteristics of the land resource base in the two areas. Projections of production and acreage were developed with the aid of linear programming models of the agricultural sectors of North and South Carolina. Statewide projections were disaggregated to respective subbasin levels according to historical shares of acreage and production.

The most likely level of future agricultural production in North Carolina and the North Carolina portion of the basin is expected to correspond to the OBERS E' projections[1/]. In the North Carolina portion, cropland acreage is projected to increase by 47 percent between 1970 and 2000. The land in hay and pasture is projected to decline. Idle cropland is expected to decrease from 20 percent in 1970 to eight percent in 2000 (Table IN-3). Forest land acreage is projected to decline.

Projected changes in land use are derived from projections of production levels for major crops and corresponding crop yields to 2000. Projected production and acreages for these crops in the North Carolina portion are summarized in Table IN-4 and Figure IN-2. Production of corn, soybeans and peanuts is projected to increase dramatically over the 1970 base levels. Corresponding acreages for these crops are projected to increase substantially by 2000, particularly for soybeans. Cotton production and acreage are projected to continue on a downward trend through 2000. Acreage and production within the North Carolina portion, as percentages of statewide projections, are relatively similar for most crops in 2000 (Table IN-4).

Meeting the OBERS E' projections in the South Carolina portion of the basin would require conversion of forest land to cropland to the extent that the projected demand for wood fiber could not be met. The OBERS E' projections were therefore reviewed for correspondence to meet trends in the state. Cropping patterns associated with the OBERS E' projections were revised to permit increases in cotton, corn and wheat acreage over the projected levels. Soybean production is expected to expand rapidly but not to the levels in the OBERS E' projections. With the revised projections, about 162,000 acres of forest land are expected to be converted to cropland[2/].

With the exception of cotton and oats, increases in production in 2000 over 1974 are projected for all major crops, particularly for soybeans and

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1/ These are a set of nationally consistent agricultural projections reflecting recent high levels of agricultural exports as prepared by the U.S. Department of Commerce and the U.S. Department of Agriculture for the U.S. Water Resources Council. See U.S. Water Resources Council, 1972 OBERS Projections Regional Economic Activity in the United States. Series E' Population Supplement Agricultural Projections, Washington: U.S. Government Printing Office, 1975.

2/ Report 1 (see front cover).

TABLE IN-3: HISTORICAL AND PROJECTED AGRICULTURAL LAND USE TO 2000

YADKIN-PEE DEE BASIN

	1970	2000
	------(Thousand Acres)------	
North Carolina Portion		
Harvested Cropland	893.6	1,313.4
Hay and pastureland	604.7	590.5
Idle cropland and idle pastureland	377.1	173.9
Total	1,875.4	2,077.8
South Carolina Portion		
Harvested Cropland	1,066.0 1/	1,087.4
Hay and pastureland	255.0 1/	332.9
Idle cropland and idle pastureland	278.0 1/	223.0
Total	1,509.0 1/	1,643.3
Basinwide		
Harvested Cropland	1,959.6	2,400.8
Hay and pastureland	859.7	923.4
Idle cropland and idle pastureland	655.1	396.9
Total	3,384.4	3,721.1

1/ Acres for 1974.
SOURCE: Report 1 (see front cover).

TABLE IN-4: HISTORICAL AND PROJECTED PRODUCTION AND ACREAGE OF STATE PRODUCTION AND ACREAGE FOR MAJOR CROPS, 1970 AND 2000

YADKIN-PEE DEE BASIN (NORTH CAROLINA PORTION)

Crop	Unit	1970		2000	
		Production	Acreage	Production	Acreage
		(Thousands)			
Corn Grain	bu.	17,290	284	31,670	347
Corn Silage	tons	520	42	1,240	84
Soybeans	bu.	4,190	209	15,860	574
Wheat	bu.	3,280	94	2,940	67
Barley	bu.	1,340	33	2,000	41
Oats	bu.	2,200	43	2,050	31
Peanuts	lbs.	65,430	31	126,740	42
Sorghum	bu.	1,280	25	2,330	35
Cotton	lbs.	12,020	39	2,740	7
Burley Tobacco	lbs.	1,940	1	1,990	0.7
Flue Cured Tobacco	lbs.	146,530	90	176,140	83
Sweet Potatoes	cwt.	590	4	410	2
Hay	tons	140	86	160	84
Improved Pasture	tons	600	366	880	458
Unimproved Pasture	tons	160	152	50	48
Total Acreage			1,499		1,903.7

SOURCE: Report 1 (see front cover).

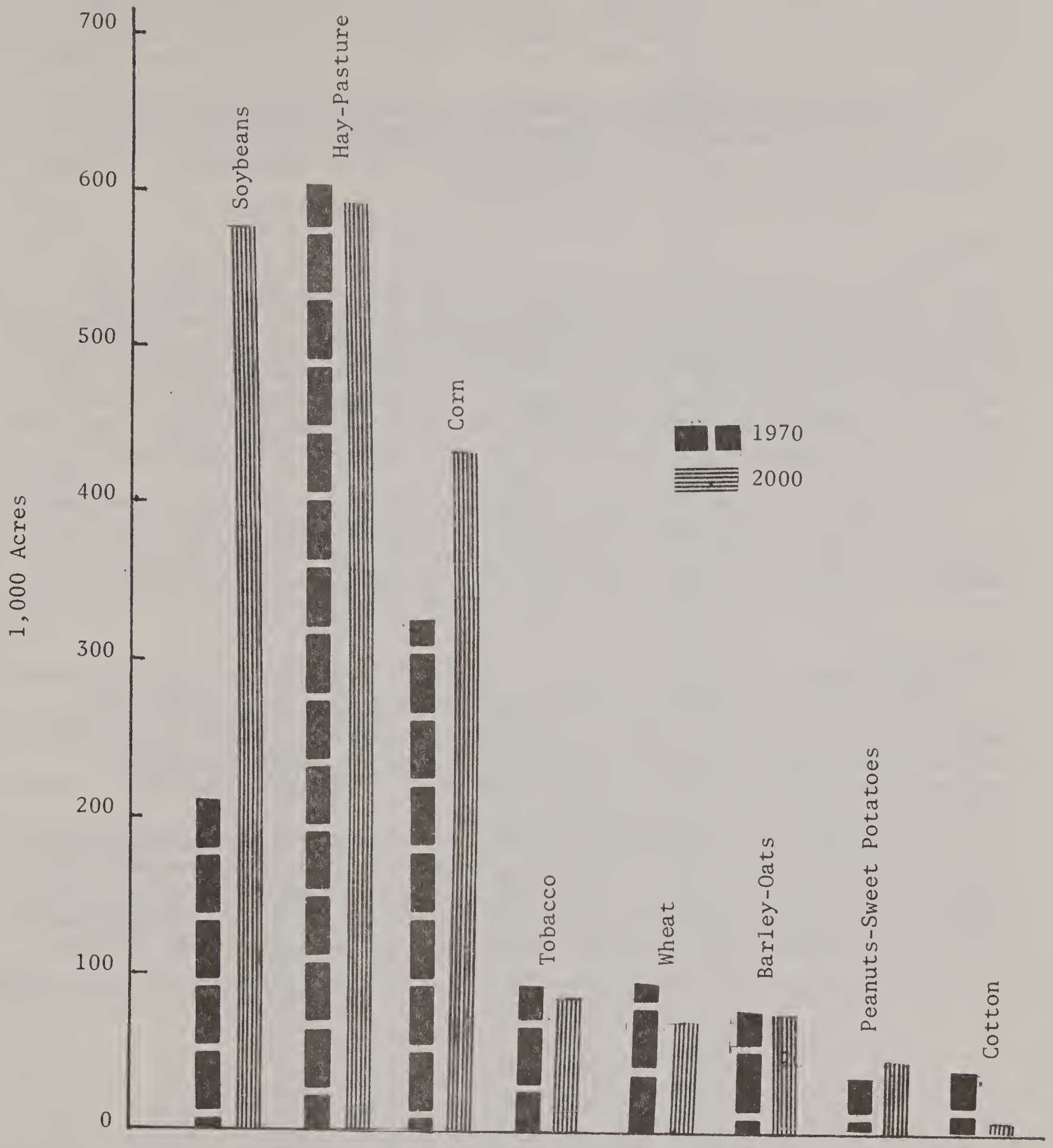

FIGURE IN-2: HISTORICAL AND PROJECTED ACREAGE FOR 1970 AND 2000 NORTH CAROLINA PORTION, YADKIN-PEE DEE RIVER BASIN

SOURCE: REPORT 1 (see front cover).

peanuts (Table IN-5). Production of these two crops along with tobacco is expected to continue to increase. Corresponding acreages for producing major crops are also in Table IN-5 and in Figure IN-3. The most notable changes over the 1974-2000 period are the reductions in cotton acreage and increases in soybean acreage.

Production and acreage of soybeans in the South Carolina portion as a percentage of statewide levels is projected to remain relatively constant over the planning period (Table IN-5). Crops such as corn, oats and wheat are expected to be relatively less important.

Forestry

Forest stands cover 58 percent of the basin's total land area. The North Carolina portion has four million acres in forest land, while the South Carolina portion has three million acres in timber. Timber production in the basin in 1974, totaled 203.7 million cubic feet of wood fiber having a stumpage value of $86.5 million. Softwood logs make up 78 percent of the volume cut. Forested areas also support recreational activities, wildlife habitat and some grazing for livestock. In 1972, forest industries employed 53,300 people representing 19 percent of total manufacturing employment in the basin.

The number of acres of land in forest products is expected to decline as demands for urban growth and agricultural products are increased. Even though the number of acres is expected to decline, production per acre is expected to increase. Table IN-6 shows the projections for available forest land and net growth by the year 2000.

General Data

Reports have been made during the progress of the study to provide information on base conditions and projections of agricultural production, water and land resources, erosion and sediment problems, forest resources including management problems, agricultural water management problems, recreational resources, and potential dam sites. See front cover for additional information on published reports.

The planning period for projections and alternatives was generally from 1978 to the year 2000. The 1978 base year was adjusted to accommodate data available from other sources. Examples include the 1970 Census of Population, the 1974 Census of Agriculture, the 1974 South Carolina Forest Survey, the 1977 North Carolina Forest Survey and the 1967 Conservation Needs Inventory.

TABLE IN-5: HISTORICAL AND PROJECTED PRODUCTION AND ACREAGE OF STATE PRODUCTION AND ACREAGE FOR MAJOR CROPS, 1974 AND 2000

YADKIN-PEE DEE RIVER BASIN (SOUTH CAROLINA PORTION)

Crop	Unit	1974		2000	
		Production	Acreage	Production	Acreage
		(Thousands)			
Corn	bu.	11,340	189	17,970	225
Soybeans	bu.	10,090	514	26,500	719
Wheat	bu.	1,030	40	1,670	32
Barley	bu.	270	7	330	6
Oats	bu.	790	19	100	2
Peanuts	lbs.	16,150	8	27,800	9
Cotton	lbs.	59,040	164	23,600	41
Tobacco	lbs.	131,930	65	136,300	52
Hay-Pasture	tons	340	225	620	333
Total Acreage			1,231		1,419

SOURCE: Report 1 (see front cover).

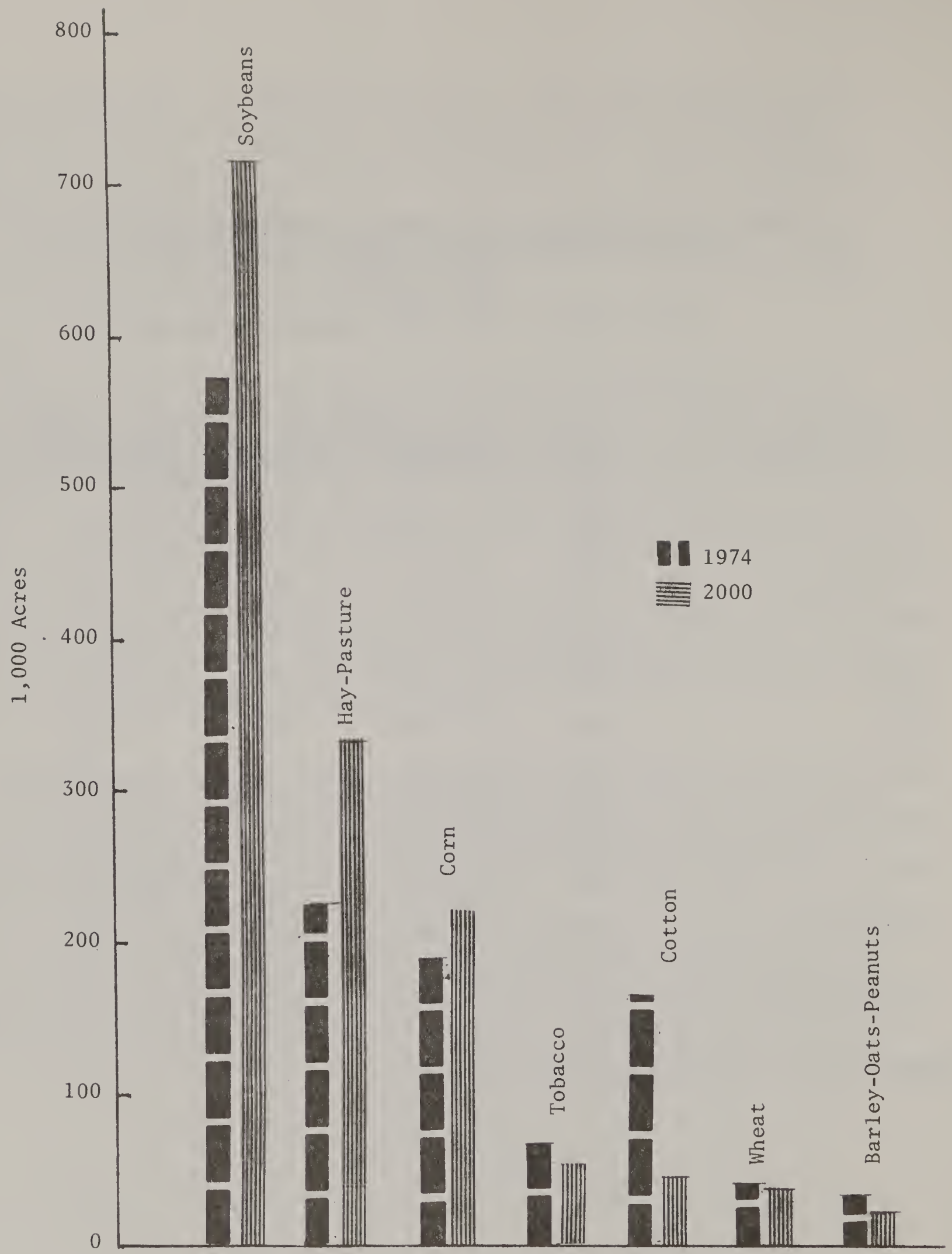

FIGURE IN-3: HISTORICAL AND PROJECTED ACREAGE FOR 1974 AND 2000

SOUTH CAROLINA PORTION, YADKIN-PEE DEE RIVER BASIN

SOURCE: REPORT 1 (see front cover).

TABLE IN-6: HISTORICAL AND PROJECTED FOREST LAND AND NET ANNUAL GROWTH

YADKIN-PEE DEE BASIN

	1980		2000	
	Forest Land (thousand acres)	Annual Growth (million cu.ft.)	Forest Land (thousand acres)	Annual Growth (million cu.ft.)
North Carolina Portion	4,080.8	236.7	3,900.8	284.3
South Carolina Portion	2,987.6	206.1	2,867.6	254.9
Yadkin-Pee Dee Basin	7,068.4	442.8	6,768.4	539.2

SOURCE: Report 5 (see front cover).

CHAPTER 1
PROBLEMS

Public concerns were identified by study sponsors and citizens advisory committees at the beginning of the study. General concerns that were identified included low farm income, degraded water quality, misuse of natural resources, damages from adverse weather, and uncertain future water supplies. For this study, those problems primarily associated with agriculture and forestry were selected for consideration. Both economic and environmental problems were selected. Some potential problems that might be created during construction were also selected for consideration. The following problems were selected for consideration in this study:

I. Soil erosion and resulting sedimentation
II. Loss or degradation of resources - conversion of prime farmland to other uses, conversion of prime forest land to other uses, destruction of wetlands, change in the visual quality of the rural landscape and loss of historical and archeological sites
III. Future shortage of wood fiber
IV. Frequent yield and income loss due to drought
V. Frequent crop loss due to flooding and wetness
VI. Floodwater damage to nonagricultural properties
VII. Shortage of community water supplies
VIII. Undeveloped recreational resources

I. Soil Erosion and Resulting Sedimentation

The most widespread problem in the basin is soil erosion on cropland. Closely associated with erosion are sedimentation, water pollution, reduced farm income, degradation of fish and wildlife habitat, and deterioration in visual quality.

Sheet and rill erosion occurring on cropland is the most significant erosion problem. Approximately 18 million tons of soil are eroded from cropland each year. This is about 70 percent of all erosion in the basin. Yet, it occurs on only one-fourth of the land area. About one-half million acres of sloping land in the Piedmont and Upper Coastal Plain produces more than one-fourth of the total erosion. The second largest source of erosion is that associated with rural roadsides and roadbanks. Approximately five million tons of soil are eroded annually from 266,000 acres of rural road rights-of-way. Disturbances on forest land account for an annual soil loss of one million tons[1/]. Logging roads,

1/ Report 5 (see front cover).

skid trails, and mechanical disturbances at tree planting sites account for most of the forest land erosion[1/]. Urban and other land uses are the sources of another 1.5 million tons. Stream channel and gully erosion rates are high in local areas and total 0.3 million tons lost each year within the basin. Pasture and grassland are the areas least affected by erosion; yet, 0.2 million tons erode annually. The ranking of major land resource areas (MLRAs) according to severity of erosion rates from highest to lowest is the Southern Piedmont, Blue Ridge, Carolina and Georgia Sand Hills, Southern Coastal Plain and Atlantic Coastal Flatwoods (Figure IN-1).

Erosion data collected in the Southern Piedmont indicate cropland with slopes of greater than five percent contributes about 80 percent of all cropland erosion. Only about 20 percent of this land is adequately protected. Erosion along rural dirt roads is highest in this area due to steep road cuts and sharp topographic relief. Approximately 200 tons of soil per mile annually erode from these roads.

Cropland erosion in the Carolina and Georgia Sand Hills MLRA increases significantly when slopes exceed three percent. Clean tilled row crops are usually associated with the highest erosion rates. Annual soil loss on cotton, corn and soybean fields averages 10 tons per acre. This rate exceeds the soil loss tolerance, "T", by five tons per acre[2/]. Road associated erosion is approximately 170 tons per mile or 23 tons per acre.

Erosion is less severe in the Southern Coastal Plain MLRA. Gentle slopes, sandy soils and less rainfall runoff create a less erosive condition. Soil losses are generally less than the "T" value. Although the general condition is acceptable, there are many areas with excessive erosion due to up and down hill farming on larger fields. Road associated erosion is approximately 117 tons per mile or 14 tons per acre. Wind erosion is significant on large flat fields in this area.

Sheet and rill erosion is minor in the Atlantic Coast Flatwoods MLRA. Wind erosion on large flat fields can be a problem. Wind erosion damages are most prevalent in the early spring, especially during April when young crops are just emerging. In addition to severe damage on 100,000 acres of cropland, wind-blown soil often covers fences and fills drainage and roadside ditches. Severe windstorms blow away the fine soil particles

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1/ Report 4 (see front cover).

2/ "T", the soil loss tolerance value indicates the rate of soil loss in tons per acre per year that will allow a high level of crop production to be sustained economically and indefinitely.

Sheet and rill erosion on cropland and pastureland accounts for about 70 percent of the total erosion in the basin.

Erosion on forest land is the result of timber harvest operations and site preparation.

Critically eroding areas produce sediment, pollute water, deteriorate scenic quality and result in a loss of the soil resource.

and leave coarse and infertile particles on the surface which often result in lower moisture holding capacities and reduced yields. Road associated erosion is two tons per acre in this area.

Twenty-five million tons of soil are eroded from the soil profiles of the basin annually. Part of this material is trapped within the area from which it is eroded by terraces, natural breaks in slopes, diversions, waterways, field borders, fence rows or adjacent forested areas. The remainder becomes sediment which reaches streams, farm ponds, large reservoirs and finally, Winyah Bay. Sediment lowers water quality, transports pollutants, damages flood plain soil and vegetation, reduces reservoir and channel capacities and fills wetland areas and bays. Erosion on roadways produces sediment which damages traveled surfaces, ditches and culverts increasing road maintenance expenses.

The severity of sediment problems within the basin is directly proportionate to the gross erosion within each major land resource area. Average annual suspended sediment concentrations range from a high of 1,300 to a low of five parts per million (ppm)[1/]. The higher concentrations usually occur in smaller tributaries where large amounts of sediment are available and stream flows are low. The lowest sediment concentrations occur just downstream from the larger reservoirs which trap most of the suspended sediment and all of the bedload material.

Approximately 1,600 acre feet of sediment is trapped in the major reservoirs annually. The capacities of several reservoirs are being reduced at an excessive rate. High Rock Lake, Salem Lake, Tucker Town Lake, Badin Lake, Lake Tillery, Blewett Falls Lake, Lake Monroe and Lake Lee are some of the reservoirs being most seriously damaged. Smaller lakes account for 400 acre feet of sediment trapped annually[2/]. (See Figure 1-1 for existing impoundments of 100 acres or more.)

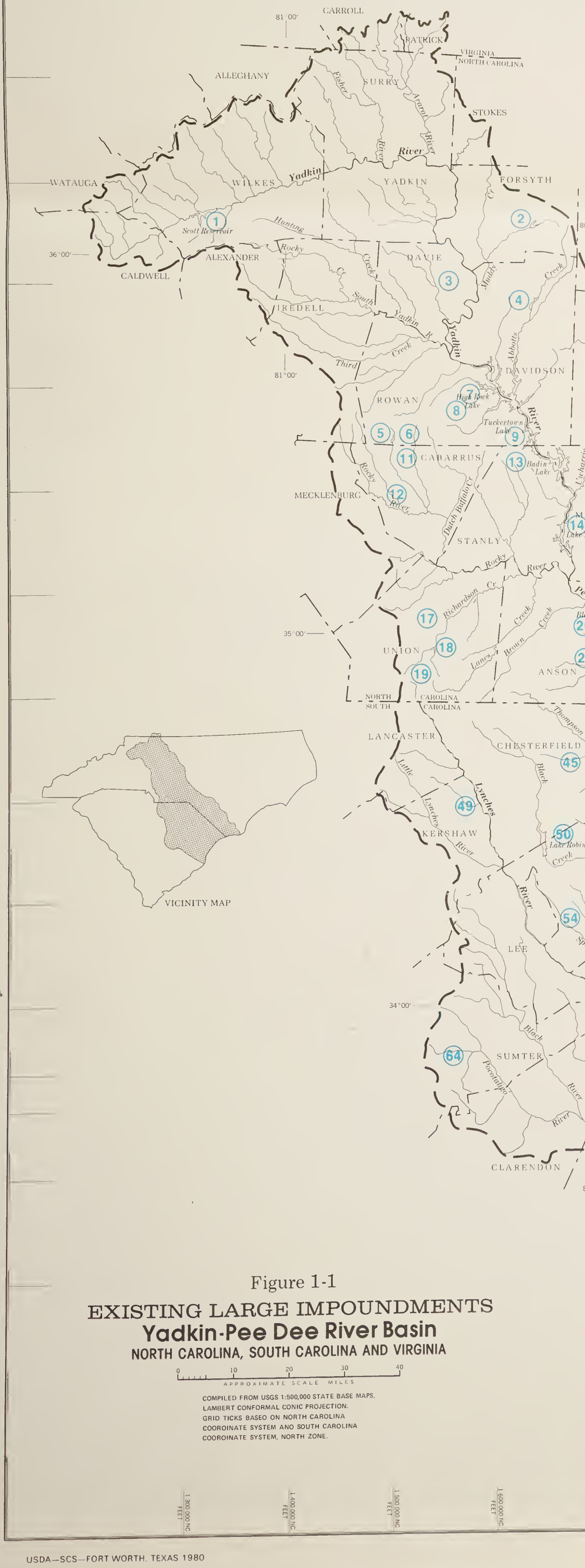
Sediment deposited on flood plain soils in the Southern Piedmont MLRA creates more significant damages to agricultural productivity than any other area of the basin. About one acre in 10 of the agricultural flood plain land is damaged to some extent in this area. Productivity is reduced by more than 20 percent on about half of the damaged acres. One of every 13

1/ Parts per million approximates milligrams per liter. See Table VII, Erosion and Sediment Inventory. Report 4 (see front cover).

2/ Report 3 (see front cover).

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



LEGEND

NO.	NAME
	NORTH CAROLINA
1	W. Kerr Scotts Reservoir
2	Salem Lake
3	Dutchman Creek, Dam 15A
4	Lexington-Thomasville Reservoir
5	Cannon Lake
6	Lake Fisher
7	Granite Lake
8	High Rock Lake
9	Tucker Town
10	Asheboro City Lake No. 4
11	Concord Lake
12	Coddle Creek
13	Badin Lake
14	Lake Tillery
15	Eury Lake
16	Falls Lake (Narrows)
17	Lake Stewart
18	Lake Lee
19	Lake Monroe
20	Blewett Falls
21	Wadesboro Municipal Pond
22	Ledbetter Pond
23	Roberdel Lake
24	Midway Lake
25	Everetts Mill Pond
26	Big Muddy
27	Richmond Mill Pond
28	Lytches (Crossway) Pond
29	Hayes Pond
30	Johns Pond
31	Antioch (Hodgins) Pond
32	McNeils Pond
33	Lumbee Recreation Center

NO.	NAME
34	Maxton Pond
35	Johnson's Pond
36	Warwick Pond
37	CP&L Cooling Pond
38	Atkinson Pond
39	Bryants Mill Pond
40	Hester Mill Pond
41	Singletary Pond
42	Council Mill Pond
43	Lake Waccamaw
44	Schulkens Lake
	SOUTH CAROLINA
45	Teals Mill
46	Eureka Lake
47	Lake Wallace
48	Drakes Mill Pond
49	Raley Mill Pond
50	Lake Robinson
51	Prestwood Lake
52	T. C. Coxe
53	E. E. Dargan
54	Marco Mill Podd
55	Jefford Mill Pond
56	Gaddys Milly Pond
57	Pages Mill Pond
58	Oakdale Lake
59	Forest Lake
60	McIntyres Mill Pond
61	Grainger Mill Pond
62	Busbee Lake
63	Billy Foxworth
64	Edwin Boyle

(1) Existing Impoundments

1,000,000 NC FEET
900,000 NC FEET
800,000 NC FEET
700,000 NC FEET
600,000 NC FEET
500,000 NC FEET
400,000 NC FEET
300,000 NC FEET
200,000 NC FEET
100,000 NC FEET
300,000 SC FEET
000,000 NC FEET
200,000 SC FEET
100,000 SC FEET

VICINITY MAP

1-6

Figure 1-1

EXISTING LARGE IMPOUNDMENTS

Yadkin-Pee Dee River Basin

NORTH CAROLINA, SOUTH CAROLINA AND VIRGINIA

0 10 20 30 40
APPROXIMATE SCALE MILES

COMPILED FROM USGS 1:500,000 STATE BASE MAPS.
LAMBERT CONFORMAL CONIC PROJECTION.
GRID TICKS BASED ON NORTH CAROLINA
COORDINATE SYSTEM AND SOUTH CAROLINA
COORDINATE SYSTEM, NORTH ZONE.

1,300,000 NC FEET
1,400,000 NC FEET
1,500,000 NC FEET
1,600,000 NC FEET
1,700,000 NC FEET
1,800,000 NC FEET
1,900,000 NC FEET
2,000,000 NC FEET
2,100,000 NC FEET
2,200,000 NC FEET

OCTOBER 1978 4-R-36084

REVISED FEBRUARY 1979 BASE 4-R-35938

USDA—SCS—FORT WORTH, TEXAS 1980

acres of agricultural flood plain in the Southern Coastal Plain and Carolina and Georgia Sand Hills MLRAs is damaged. In total, 1,000 acres of flood plain are damaged each year.

Damages from overbank sediment are minor on flood plains in the Atlantic Coastal Flatwoods MLRA. The sediment damages in this area are channel fill and road culvert blockage. These cause flooding in small communities and along rural roadways. The major damage to agricultural land is swamping caused by sediment deposits.

Sediment, an end product of soil erosion, is by volume the greatest single pollutant of surface waters and the principal carrier of some chemical pollutants. In most of the basin, the primary source of sediment results from erosion of cropland. In the area of sandy soils, the movement of soil by wind exceeds that moved by water. In addition to cropland, areas with potential for sediment production include gullies, construction areas, dirt roads, mined areas and bare areas. Other water pollutants may come from fertilizers, pesticides and animal wastes associated with farming operations.

Pollution, especially from sediment, damages freshwater fishery resources. Sediment disturbs fish beds and carries with it pollutants which degrade water quality. Municipal and industrial wastes, as well as wastes from livestock operations, create pollution problems in some areas.

The proliferation of certain weeds in lakes and ponds has caused a real loss to fishermen. As more people move into the basin, the demands on the fishery habitat are increased. At the same time, the increased development tends to encroach on existing wildlife and fishery habitat[1/].

II. Loss or Degradation of Resources

Acres of land in farms declined by about 10 percent during the 1969-74 period. Declines in the basin were similar to respective statewide reductions[2/]. In 1970, population in the basin was about 1.9 million. With projected increases of 43 percent from 1970 to 2000, considerable demand for agricultural and forest land for nonagricultural uses can be expected. About 2,000 acres of land converted to nonagricultural uses

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1/ Report 6 (see front cover).
2/ Report 1 (see front cover).

each year will be prime farmland[1/] and 900 acres will be prime forest land. There is current nationwide concern for preserving these lands for future use. The basin includes 1.8 million acres of prime farmland and 1.4 million acres of prime forest land[2/]. Continuing and accelerated erosion could also result in existing farmland becoming unproductive or having impaired productivity. Prime farmlands and forest lands are being taken from production by the construction of highways and lakes, development or urban areas and mines.

Appearance of the rural landscape changes when agricultural land is converted to nonagricultural uses and when timber is harvested. These changes are especially noticeable when they can be seen from scenic highways and from trails and overlooks. Some portion of the 113,000 acres[3/] of forest land harvested each year will have an impact upon visual quality. The visual quality of cropland is often disturbed by poorly planned drainage systems, livestock lagoons or other farming practices.

Drainage of land for agricultural use, land filling for construction and other activities sometimes damage high value wetlands. Wetlands are sensitive areas and any alteration may upset their balance. About 800 acres of the 1.3 million acres are lost annually.

Neglect of historical and archeological sites is causing deterioration of some sites, while others are destroyed by development. There is a need for identification, protection and preservation of these sites.

See Problem I, Sediment and Erosion Damages, for degradation of water quality.

III. Future Shortage of Wood Fiber

Six problems related to the basin's forest resources were identified[4/]. Although each problem should be included in the overall planning effort to develop and protect the basin's natural resources, concern for shortage of wood fiber should have priority because of projected demand and the time required to produce harvestable stands. Production of pine sawlogs requires from 35 to 50 years to complete a cycle of growth.

1/ Prime farmlands are defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is also available for these uses.

2/ Report 3 (see front cover).

3/ Report 5 (see front cover).

4/ Report 5 (see front cover).

Hardwood stands require 50 to 70 years.

Over the past few years, there has been a decline in the acres of timber land. This trend has come about by the gradual increase in land used for urban development, the clearing of forest land for crops and a reduction in tree planting. Area in forest is declining at about 15,000 acres per year.

IV. Frequent Yield and Income Loss Due to Drought

Droughts during two of the past five years have reduced the value of crop yields by several hundred million dollars. Most of the farmers in the basin were not prepared for this emergency. For many years, irrigation has been used for high value crops such as tobacco, vegetables and peaches. Past history shows irrigation of other crops to be primarily supplemental. Following the great losses from dry weather, numerous farmers are now installing irrigation systems. Up to the present time, water supplies have been adequate to meet demands in most areas. The major need is for an additional 30,000 acre feet of storage within pumping distance of crop fields. Estimates are based on one acre foot of storage for each acre to be irrigated.

V. Frequent Crop Loss Due to Flooding and Wetness

Average annual flooding and wetness[1/] losses to agriculture are estimated to be more than $31 million for the basin[2/]. The major portion of this annual loss is from crop damages. Losses occur along flood plains in the Piedmont and Mountains and in the flat fields of the Coastal Plain. About 300,000 acres in the Piedmont and Mountains flood from time to time and over three million acres in the Coastal Plain are subject to flooding. Agricultural losses are measured in lost crop yields, reduced grazing, washed out roads, damaged buildings and debris deposits on fences and fields. Other losses associated with flooding are streambank erosion, deposition of sediment in channels, lakes, ponds and flood plains, swamping of land and flood plain scour.

VI. Floodwater Damage to Nonagricultural Property

At least 154 communities in the basin experience flooding losses. Floodwater damage records show an increase in losses indicating an increase in damageable values in flood plains. Flooding and wetness problems are environmental, as well as economic. Floodwater around homes and businesses increases health and safety

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1/ Wetness in this report refers to a high water table in soils that cause problems during preparation, planting, growing or harvesting seasons.

2/ Report 8 (see front cover).

Flooding of cropland along the Pee Dee River.

Flooding problems are often compounded by floating debris.

Floods destroy crops, scour the land and deposit sediment on the flood plains.

Homes and other property are often damaged by floods such as the one of October 1979, in the Coastal Plain portion of the basin.

hazards. Floodwater transports sediment and deposits it in flood plains, streams and lakes. Sediment deposition tends to lower water quality. Sediment deposition in water smothers fish eggs, fills in fish spawning areas, tends to keep the stream bottom unstable and encourages undesirable aquatic plant growth. Overbank deposition covers the more productive soil, disturbs plant communities and destroys nesting areas for birds and small mammals.

VII. Shortages of Community Water Supplies

As communities plan for future growth and development, one major consideration is an adequate supply of water. As each community projects its future water source, other communities sometimes are planning for use of the same source. The scope of this study does not include solving these conflicts; but it does include analysis of potential dam sites which could provide water storage. The U.S. Water Resources Council, Level B Study for the Yadkin-Pee Dee Basin provides information on water shortages.

VIII. Undeveloped Recreational Resources

Several types of recreational opportunities are available in the Yadkin-Pee Dee River Basin. Shortages of Class I facilities--playgrounds plus city and neighborhood parks--occur throughout the basin, particularly in the more densely populated North Carolina portion. While available facilities are underutilized in some localized areas, an estimated 3,500 and 1,220 acres are currently needed within the North Carolina and South Carolina portions, respectively[1/]. Classes II and III recreational areas--district and regional parks plus specialized outdoor recreation areas in North Carolina--are also inadequate in the basin relative to the demand associated with population distribution in the area. Comparable recreational areas in the South Carolina portion tend to exceed estimated needs.

Table 1-1 shows a summary of present problems identified by the study.

1/ Report 2 (see front cover).

TABLE 1-1: PROBLEMS - 1980

YADKIN-PEE DEE BASIN

Problems	Extent
I. Soil Erosion	
A. Sheet and Rill Erosion	19.2 million tons/yr. eroding
1. Excessive erosion on crop and pastureland	744,000 acres not adequately treated
2. Erosion during forest site preparation	20,000 acres unprotected
B. Critical Area Erosion	6.8 million tons/yr. eroding
1. Gullies	60,000 acres eroding
2. Roadbanks	266,000 acres eroding
3. Logging roads	2,000 acres disturbed each year
4. Construction sites	9,000 acres disturbed each year
II. Loss or Degradation of Resources	
A. Loss of Prime Farmland	1,700 ac./yr. loss
B. Loss of Prime Forest Land	2,500 ac./yr. loss
C. Loss of Wetlands	800 ac./yr. loss
D. Change in Rural Landscape	1,700 ac./yr.
E. Loss of Historical and Archeological Sites	not evaluated
II. Future Shortage of Wood Fiber	
A. Understocked Forests	1,984,000 acres
B. Unproductive Forests	475,000 acres
C. Insects, Diseases and Fires	50,000 acres
IV. Frequent Yield and Income Loss Due to Drought	$40 million annual loss
Irrigation Water Shortage	30,000 ac.ft.
V. Frequent Crop Loss Due to Flooding and Wetness	$31 million annual loss
A. Flooding in the Mountains and Piedmont	$3.9 million annual loss
B. Wetness in the Coastal Plain	$27.1 million annual loss
VI. Floodwater Damages to Built-up Areas	154 communities
II. Shortage of Community Water Supplies	
Community Water Storage	1/
II. Undeveloped Recreational Resources	4,700 acre shortage
A. Fishing Opportunities	no present shortage
B. Hunting Opportunities	no present shortage
C. Recreational Areas	4,700 acre shortage

See U.S. Water Resources Council, "Level B Study for Yadkin-Pee Dee Basin".

Flooding and wetness on flat land areas are inseparable problems that restrict land use and result in loss of agricultural production.

Rural communities are damaged by flooding and inadequate drainage outlets.

CHAPTER 2
RESOURCE DEVELOPMENT OPPORTUNITIES

Several public concerns related to use of water and land resources were identified. At times, resolution of one concern, such as loss of land resource through soil erosion and urban development, will also contribute to resolving other concerns such as sedimentation of streams and lakes and deterioration in visual quality of the rural landscape. Addressing other concerns, such as the shortage of wood fiber, may be in conflict with concerns for decreasing soil erosion and sedimentation as well as increasing the amount and quality of wildlife habitat. These complementarities and conflicts among public concerns provide challenges to resource planners to devise a prioritizing of concerns and to determine trade-offs among these concerns in the text of availability of public monies and legislated authorities to influence resource use and management. Such challenges are made more complex due to substantial increases in population projected for the basin, the strength of individual property rights affecting resource use and growing demands for alternate uses of public monies. Fortunately, resource use conflicts in the Yadkin-Pee Dee Basin have not yet become as severe as in other areas of the nation.

Economic Development Versus Environmental Quality

The basin will be called upon to produce an ever increasing quantity of agricultural products (Tables IN-4 and IN-5). Past increases in demand have been largely met by improved technology and higher usage of agricultural chemicals. Recently, higher production has come from increased cropland acres. These acres have been converted from idle land, pastureland and forest land. In the future, increased production will come from improved technology, improved drainage, an expansion of irrigation and a larger cropland base. Questions facing planners include: How can erosion be kept within tolerable limits with increased production when erosion and sedimentation are already a major concern? How can production be increased with minimum land clearing so to meet future demand for wood products? To meet projected production under the "future without" condition (Tables IN-4 and IN-5), an estimated 22,000 acres of forest land would need to be converted to cropland in the Yadkin (North Carolina) portion and about 162,000 acres in the Pee Dee (South Carolina) portion by year 2000. Also, what are the impacts of improved water management practices such as drainage and irrigation on land and water requirements to meet projected levels of production and what are the corresponding distributions of costs and returns of these practices to landowners, including the "small farmer" group?

Several land treatments and other activities for addressing public concerns were identified in Table 4C-2, Erosion Control Measures. Improved drainage can reduce crop losses due to flooding and wetness and contribute to economic development through higher farm incomes. (See Table 4B-4, Reduction of Wetness Problems.) Many measures to control soil erosion and

reduce sedimentation do not contribute to increases in productivity and net farm incomes in the short run. They do, however, enhance environmental quality. Other treatments such as conservation tillage and grassland stand improvement could contribute to both economic development and environmental quality. Conversion to grassland and installation of grassed waterways and windbreaks take land out of row crop production and provide few economic returns to landowners. Small-scale farmers could be especially impacted. Tenant-operators with short-term leases tend to be not interested in land treatments unless there is an immediate economic return to implementation. Conversion of active cropland with excessive soil erosion to forest land through planting trees has the same consequence for most landowners during their economic planning periods. The absence of regulations on erosion control and lack of economic incentives discourage landowners from adopting these practices. The public may, however, decide to create such incentives and (or) disincentives to protect the quantity and quality of natural resources for use by future generations.

The possible effects of implementing selected land treatments--improved drainage and conversion of field crops to permanent vegetation where soil erosion is excessive--on land use and net returns to agriculture were examined through application of individual linear programming models for the entire States of North and South Carolina. The models were formulated to estimate these effects in the context of meeting projected levels of production in year 2000 by using available land resources in those patterns minimizing costs of production (Appendix 1). The models were also formulated in terms of maximizing profits given available land resources (Appendix 2). Estimated changes associated with these land treatment programs in comparison with meeting "future without" condition projections in year 2000 under cost minimization conditions are in Tables 2-1 and 2-2 for North and South Carolina, respectively.

Results at state levels were disaggregated into individual reaches--subareas of the states--based on historical shares of production among respective reaches. Reach 4 in North Carolina and Reach 3 in South Carolina are referred to as the Yadkin and Pee Dee portions, respectively, and approximate the hydrologic boundaries of the two subbasins (Figure 2-1). The land treatments were applied statewide. The effects within individual reaches were linked to the occurrence of soil productivity groups (SPGs) selected for treatment within those reaches. These SPGs are described in Appendix 1.

Water Management

Improved drainage can contribute to reducing crop loss and to improving low farm incomes, particularly if public projects are used. Improved drainage and higher crop yields could partially offset the loss of production resulting from conversion of cropland with excessive soil erosion to permanent vegetation. The greatest natural problem is the location of adequate channel outlets. Individuals must often combine their efforts through group efforts or project action to effectively manage water problems. Individual landowers may not have money to install the systems, particularly small-scale operators. From an aggregative view, improved drainage permits realizing production goals with fewer acres of cropland. But the distribution of costs and returns to individual landowners will influence their voluntary decision

TABLE 2-1: ESTIMATED CHANGES IN LAND USE AND NET RETURNS ASSOCIATED WITH IMPROVED DRAINAGE AND EROSION CONTROL PROGRAMS IN COMPARISON WITH "FUTURE WITHOUT CONDITION" PROJECTIONS TO YEAR 2000 UNDER COST-MINIMIZATION CONDITIONS, BY REACH WITHIN NORTH CAROLINA

YADKIN-PEE DEE BASIN

Reach	Planted Cropland, Hayland and Pasture	Inactive Cropland, Hayland and Pasture	Cropland Transfer 1/	Total Cropland, Hayland and Pasture 2/	Net Returns 3/
	(1,000 acres)				($1,000)
		Improved Drainage 4/			
1	- 33.6	5.7	- 28.0	- 28.0	480
2	- 32.7	17.0	- 15.7	- 15.7	10,690
3	- 53.5	15.4	- 38.1	- 38.1	5,180
4 (Yadkin Portion)	- 58.8	40.3	- 18.5	- 18.5	- 9,620
5	- 57.9	50.7	- 7.3	- 7.3	- 1,000
North Carolina	-236.5	129.1	-107.6	-107.6	5,730
		Moderate Erosion Control 5/			
1	- 5.7	0	- 5.7	- 5.7	- 1,130
2	0	0	0	0	40
3	- 1.9	0	- 1.9	- 1.9	3,320
4 (Yadkin Portion)	14.5	- 9.6	13.6	4.9	5,440
5	- 8.4	- 45.6	- 0.1	- 54.0	- 9,900
North Carolina	- 1.5	- 55.2	5.9	- 56.7	- 2,230
		Major Erosion Control 6/			
1	2.2	- 2.2	0	0	1,220
2	19.4	- 12.7	27.8	6.6	2,770
3	4.6	- 13.4	9.7	- 8.7	3,720
4 (Yadkin Portion)	- 31.9	- 54.8	41.8	- 86.8	-10,670
5	- 33.2	-143.0	44.8	-176.2	-14,500
North Carolina	- 38.9	-226.1	124.1	-265.1	-17,530

1/ Acres converted from forest land to cropland (+) and cropland to forest land (-).
2/ Planted plus inactive cropland, hayland and pasture.
3/ Net returns to land, risk, and management. Changes in value of wood products are excluded. The cost of improved drainage is estimated at $10 per acre. For the erosion control programs, average cost of establishing permanent vegetation is estimated at $85 per acre with cost sharing available at $50 per acre for a net cost of $35 per acre.
4/ Improved drainage on three soil productivity groups (SPG) resulting in a 10 percent increase for corn and soybean yields on SPG 23 and a 20 percent increase on SPGs 24 and 26.
5/ Acreage of row crops in SPGs 1 and 2 reduced by 20 percent.
6/ Acreage of row crops reduced by 20 percent for SPGs 1 and 2, 25 percent for SPG 11, 10 percent for SPG 12 and 100 percent for SPG 16.

TABLE 2-2: ESTIMATED CHANGES IN LAND USE AND NET RETURNS ASSOCIATED WITH IMPROVED DRAINAGE AND EROSION CONTROL IN COMPARISON WITH "FUTURE WITHOUT" CONDITION PROJECTIONS TO YEAR 2000 UNDER COST-MINIMIZATION CONDITIONS, BY REACH WITHIN SOUTH CAROLINA

YADKIN-PEE DEE BASIN

Reach	Planted Cropland, Hayland and Pasture	Inactive Cropland, Hayland and Pasture	Cropland Transfer 1/	Total Cropland, Hayland and Pasture 2/	Forest Land	Inactive Forest Land	Net Returns 3/
	(1,000 Acres)						($1,000)
Improved Drainage 4/							
1	- 12.3	11.5	- 0.8	- 0.8	0.8	0	1,900
2	- 70.5	0.6	- 69.9	- 69.9	- 53.9	123.8	- 4,765
3 (Pee Dee Portion	- 3.6	- 4.4	- 8.0	- 8.0	34.5	- 26.5	3,225
South Carolina	- 86.5	7.7	- 78.7	- 78.7	- 18.5	97.3	360
Major Erosion Control 5/							
1	- 10.0	- 19.0	0	- 30.0	0	0	- 1,550
2	0	-108.0	1.0	-108.0	17.0	- 18.0	- 3,920
3 (Pee Dee Portion)	8.0	- 66.0	0	- 58.0	- 17.0	17.0	- 1,720
South Carolina	- 2.0	-193.0	1.0	-196.0	0	- 1.0	- 7,140

1/ Acres converted from forest land to cropland (+) and cropland to forest land (-).
2/ Planted plus inactive cropland, hayland and pasture.
3/ Net returns to land, risk and management including changes in value of sawtimber and pulpwood products. The cost of improved drainage is estimated at $10 per acre. For the erosion control program, average cost of establishing permanent vegetation is estimated at $85 per acre with cost sharing available at $50 per acre for a net cost of $35 per acre.
4/ With improved drainage, yields for corn and soybeans are increased 10 percent on SPGs 12 and 144 and 20 percent on SPGs 16, 18, 48 and 50.
5/ Acreage of row crops reduced by 20 percent for SPGs 13 and 23; 30 percent for SPGs 19, 40 and 51; and 100 percent for SPGs 14, 24 and 35.

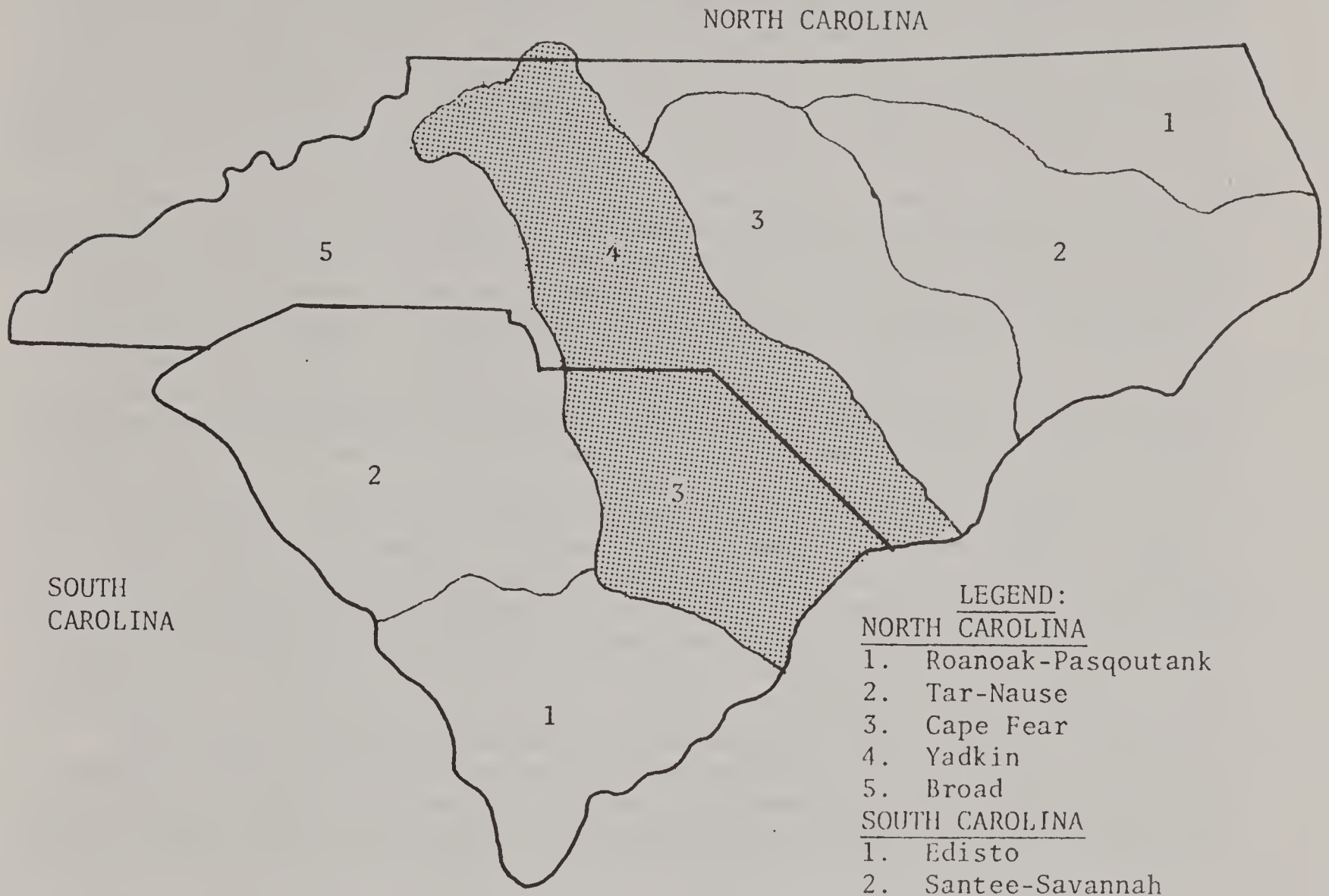

FIGURE 2-1: DESIGNATION OF REACHES WHERE REACH 4 in NORTH CAROLINA IS THE YADKIN PORTION AND REACH 3 IN SOUTH CAROLINA IS THE PEE DEE PORTION OF THE YADKIN-PEE DEE BASIN

whether or not to install drainage systems. Increasing public concern for protecting wetlands decreases opportunities for project drainage systems.

Improved drainage on selected SPGs was incorporated into the linear programming planning models. These drainage projects and estimated impacts on land use and net returns are described in Tables 2-1 and 2-2. Since the improved drainage is assumed to increase corn and soybean yields by 10-20 percent, substantially less cropland is needed in comparison to "future without" condition to meet projected production levels in year 2000 in a least cost manner. Consequently, sizeable increases in inactive uses and substantial reductions in acres of woods converted to cropland result. More acres remaining in woods will help alleviate the public concern for shortage of wood fiber.

With the program of improved drainage, annual net returns to agriculture in North Carolina are estimated to increase by $5.7 million, but a substantial reduction--$9.6 million--is estimated for Reach 4 representing the Yadkin portion (Table 2-1). With improved drainage on selected SPGs across all reaches, the comparative advantage for crop production shifts from Reach 4 to other reaches within the state. In South Carolina, the comparative advantage shifts to Reach 3 representing the Pee Dee portion. Compared to "future without" condition, annual net returns, including forestry products, are estimated to increase by $3.2 million in the Pee Dee portion and $0.4 million in the state.

As greater demands are placed on the water resources of the basin, storage of water will be required in reservoirs of various sizes. An estimated 3,400 small structures are needed to provide irrigation water near fields where irrigation is planned. Numerous sites are available and can be located in most of the areas where this kind of storage is desired. As communities need larger amounts of water for municipal and industrial uses or flood control measures, larger reservoirs are required. A number of potential sites were investigated to determine their potential for storage[1/]. All are in the North Carolina portion of the basin. Investigations of larger sites for supplying water to cities or for generating hydroelectric power are much more complex and were beyond the scope of this study.

Erosion Control

Erosion from areas in row crops accounts for a major proportion of all soil erosion in the basin and the states. Several SPGs have been identified as having soil and topographic characteristics most susceptible to eroding. If some cropland in these SPGs were converted to permanent vegetation, soil erosion would be greatly reduced. But, what would be the impact on net farm income? To examine this question, reductions in crop acreages for several SPGs located throughout the states were incorporated in the individual linear programming planning models. Acreages in hayland and pasture were not reduced. Two levels of erosion control were considered in North Carolina; only one level was specified for South Carolina. Land converted to permanent vegetation can be grazed, planted to trees and shifted to other uses.

1/ Report 7 (see front cover.)

Because the SPGs are not evenly distributed across the states, the estimated impact on land use and net returns to agriculture varies among reaches.

With a program of "moderate erosion control" where crop acreage in SPGs 1 and 2 is reduced by 20 percent, an estimated 62,600 acres would be shifted from crops to permanent vegetation across North Carolina, of which 8,700 would be within the Yadkin portion and the rest in Reach 5. When compared with the "future without" condition for realizing projected levels of production in year 2000 at least cost, this reduction in cropland availability is primarily met by converting about 55,200 acres from inactive to active cropland and an additional conversion of 5,900 acres of forest land to cropland in North Carolina. Annual net returns to agriculture were reduced by an estimated $2.2 million (Table 2-1).

The Yadkin portion represented by Reach 4 fares relatively well compared to other reaches. The reduction in crop acreage is more than offset by a conversion of 9,600 acres from inactive to active cropland and 13,600 acres converted from forest land to cropland. The net increase in cropland is 4,900 acres generating an additional $5.4 million in annual net returns compared to the "future without" condition levels.

When a program of "major erosion control" is considered, the conversion of cropland to permanent vegetation is substantial. Analyses show that 135,000 acres within the Yadkin portion and 403,000 acres for entire North Carolina would be converted from crops to some less intensive use. Even with sizeable conversion of inactive acres and woodlands to active cropland, the cropland base is reduced in the Yadkin portion by about 87,000--four percent of the projected base in year 2000 under "future without" condition--and 265,100 for the state (Table 2-1). Estimated annual net returns are also reduced by $10.7 million for the Yadkin and $17.5 million for the state, considerably higher reductions than with the "moderate erosion control" program.

To achieve a major reduction in soil erosion from cropland in South Carolina, about 211,000 acres of cropland would be converted to permanent vegetation, of which about 58,000 acres would be in the Pee Dee portion. Reductions in Reaches 1 and 2 would be about 41,000 and 112,000 acres, respectively. Such reductions would be primarily met by conversion of inactive cropland to planted cropland. Annual net returns, including forestry products are estimated to be $1.7 million lower for the Pee Dee portion and $7.1 million for the state (Table 2-2).

Several states have enacted legislation requiring mandatory compliance for controlling erosion when land and (or) streambank disturbance is planned[1/]. Maryland and Virginia, however, exempt agricultural activities from coverage. The Montana legislation, for example, requires control of soil movements from new projects, including projects such as brush removal or grazing and tree cutting on erosive sites. In the Iowa Erosion and Sediment Control Program[2/], accelerated soil erosion is identified as a nuisance. Such erosion must be abated if a complaint from an owner or

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1/ National Association of Conservation Districts. Erosion and Sediment Control Programs. Six Case Studies, 1976.

2/ Iowa Soil Conservation Districts Law. Chap 467A, as amended 1971.

occupant of land being damaged by erosion and sedimentation from another's land is filed with and upheld by the commissioners of the conservation district. However, no owner or occupant of land can be ordered to implement any new soil and water conservation practice unless cost sharing funds of at least 75 percent of the cost of any permanent practice or an amount set by the state soil conservation committee for any temporary practice are made available.

Protecting Agricultural Lands

The public concern for loss of agricultural land to urban and other nonagricultural uses and the effect on the visual quality of the rural landscape is widespread across the nation. Currently, 48 states provide for use-value assessments for farmland in order to reduce property taxes on land in agricultural production[1/]. The tax savings to encourage owners to retain their land in agriculture is greatest in proximities to urbanizing areas where prices for land are bid up well beyond their value for providing an economic return in farming. States such as New York and California have legislation for creating agricultural districts to encourage retention of agricultural land in farming[2/]. Taxing at use-value for farming is coupled with other provisions to increase the competitive position of farmers. Also, states such as New Jersey, Massachusetts and New Hampshire have statewide programs for purchasing development rights to agricultural land so as to control the rate and direction of conversion to nonagricultural uses.

USDA Assistance

The Soil Conservation Service (SCS) provides technical assistance for planning and implementing improved drainage systems. Cost sharing funds for implementing such systems are no longer available through the Agricultural Conservation Program (ACP) administered by the Agricultural Stabilization and Conservation Service (ASCS). SCS also provides technical assistance for implementing land treatments for reducing soil erosion and sedimentation. Such assistance is provided to individual landowners and as components of watershed planning activities under PL-566.

The Forest Resources Planning Act of 1974, provides for longer term planning for the management, protection and utilization of all the renewal resources on forest lands.

Federal, state and county governments jointly employ county agricultural agents as specialists to help local people in their agricultural operations.

The ASCS administers several USDA programs. Two of these, the ACP and the Forestry Incentives Program (FIP), provide cost sharing assistance

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1/ U.S. Council on Environmental Quality. Untaxing Open Space: An Evaluation of the Effectiveness of Differential Assessment of Farms and Open Space. U.S. Government Printing Office, Washington, D.C., 1976.

2/ Hexem, R., N. Bills and S. Ball. "Agricultural Districts and Land Use: A Pilot Study." A.E. Res. 80-29. Dept. of Agricultural Economics, Cornell University, Ithaca, New York. November 1980.

to landowners who implement soil, water, forest and wildlife conservation practices on their land. ASCS also administers the Rural Clean Water Program for reducing the degradation of water quality associated with pollutants from agricultural nonpoint sources.

If a voluntary approach to implement land treatment measures is to continue, USDA programs must be modified to make implementation economically feasible; public appeals for a conservation ethic by landowners must be made; and (or) if the public wants, state and local regulations and additional public monies may be used to induce implementation.

Need for Public Choices

The public needs to choose among alternative uses of public resources to address identified public concerns, some of which are conflicting within the time frame selected. The weights between promoting economic development and environmental quality within agriculture and other sectors of the economy must be determined. Following these public choices, private resource owners will determine the best use of their resources given their goals. Because results of individual decisions are seldom consistent with public preferences, ongoing adjustments in public programs and policies are necessary to create that environment in which actions by individuals approach results preferred by the public, recognizing that these public preferences change through time.

CHAPTER 3
OPPORTUNITIES FOR IMPLEMENTATION

Two alternative courses of action have been discussed in this report. The ED Alternative emphasizes economic development and the EQ Alternative emphasizes environmental quality. Neither excludes the other and numerous combinations of elements within each alternative could be used with acceptable results.

This chapter discusses implementation opportunities with emphasis on programs in the U.S. Department of Agriculture (USDA). Other federal, state and local programs may be employed to reach the desired results. Priorities for installation of projects or programs will depend upon the willingness of local units of government and other local organizations to assume leadership, financial and legal responsibilities. Ongoing federal, state and local programs will receive the first call for implementation. Where appropriate, new programs may be developed to carry out some element of the plan. Some plan elements can only be installed with significant increases in levels of funding or with additional authorities through local, state or federal programs.

All projects and programs assisted by USDA agencies must be sponsored by local organizations. Assistance may consist of technical assistance in planning, engineering services, construction inspection and maintenance. Local sponsoring organizations may be soil and water conservation districts, watershed districts, drainage districts, county boards, state agencies and other organizations with legal authorities granted by the states. Throughout the course of the study, many communities have indicated strong interest in securing help to solve their water management problems. Appropriate state agencies stand ready to provide leadership to local organizations to help them in any legal or organizational problems they may have.

USDA Programs

USDA programs are administered directly through several agencies and through cooperative programs with the states. The agencies discussed in this chapter are the Soil Conservation Service, Forest Service, Agricultural Stabilization and Conservation Service, Farmers Home Administration and the Cooperative Extension Service. Other agencies such as the Economics and Statistics Service, Federal Crop Insurance Corporation and Science and Education Administration also contribute to solving resource problems.

Soil Conservation Service

The Soil Conservation Service (SCS) carries out three basic programs that are directly involved with land and water resource conservation and development. The first is the Conservation Operation Program (PL-46) which is best known for its assistance to soil and water conservation districts in planning and installing land treatment practices. Soil surveys

and resource inventories are included in PL-46. The Small Watershed Program under PL-566 is designed to assist local organizations in watershed protection and flood prevention. River basin studies and flood plain management studies are also done under the authority of PL-566. The Resource Conservation and Development Program (RC&D) assists organizations and groups in carrying out a variety of measures to develop their land and water resources on an area basis.

Forest Service

The Forest Service (FS) provides funds to the state forestry agencies through cooperative agreements (CFM). The FS administers the Cooperative Forestry Assistance Act of 1978. It also provides planning assistance for small watershed projects and river basin studies. FS research programs provide valuable information for water resource planning.

Agricultural Stabilization and Conservation Service

The Agricultural Stabilization and Conservation Service (ASCS) provides cost-sharing assistance to landowners and operators for carrying out a variety of conservation practices. The primary programs are the Agricultural Conservation Program (ACP) and the Forestry Incentives Program (FIP). Other programs include the Water Bank Program and land retirement programs for reducing production where high levels of production depress prices received by farmers.

Farmers Home Administration

The Farmers Home Administration (FmHA) provides a wide variety of loans and grants to qualified people for the installation of conservation practices and to qualified groups for developing water resources for such purposes as water supply and recreation. Water and related resource development programs include: Emergency Loans; Farm Operating Loans; Irrigation, Drainage and other Soil and Water Conservation Loans; Recreation Facility Loans; Resource Conservation and Development Loans; Soil and Water Loans; Water and Waste Disposal Systems for Rural Communities Loans; Watershed Protection and Flood Prevention Loans; Community Facilities Loans; Area Development Assistance Planning Grants; and Economic Emergency Loans.

Science and Education Administration

The Cooperative Extension Service in the Science and Education Administration (SEA) is the educational arm of the USDA. Services are provided to residents of the basin through North Carolina State University and Clemson University.

Agricultural research in the SEA can contribute to ways of meeting needs identified in the report by developing crop varieties that can tolerate dry or extreme wet conditions.

Other contributions of SEA include cooperative forestry research, rural development research and technical information systems.

Federal Crop Insurance Corporation

The Federal Crop Insurance Corporation (FCIC) helps farmers overcome financial disaster following crop failures.

Economics and Statistics Service

The Economics and Statistics Service (ESS) can help to determine the need for resource development and the costs and returns associated with alternative development strategies.

Other Federal Agencies

Agencies other than USDA are involved in resource development. The primary agencies involved in the basin are the U.S. Army Corps of Engineers, Federal Emergency Management Agency, Environmental Protection Agency, Fish and Wildlife Service, U.S. Geological Service, National Park Service and the Department of Housing and Urban Development.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (CoE) provides planning and construction for water resource development projects for flood control, hydro power, recreation, water supply and other uses. The Corps is responsible for issuing permits for major water developments.

Federal Emergency Management Agency

The Federal Emergency Management Agency (FEMA) administers the flood insurance program and provides funds for flood insurance studies.

Environmental Protection Agency

The Environmental Protection Agency (EPA) provides assistance for improving water quality. EPA assists in the development of environmental impact statements.

Fish and Wildlife Service

The Fish and Wildlife Service (F&WS) provides assistance in planning water resource developments with special emphasis on fish and wildlife resources, water quality and protection of high value wetlands.

U.S. Geological Survey

The Geological Survey (USGS) provides several services that impact resource development. The primary jobs recognized in this study are related to water quality and groundwater development.

National Park Service

The National Park Service (NPS) provides cost-sharing funds for planning, land acquisition and construction of recreation areas. It also provides advisory service and counseling for the National Register of Historic Places and makes grants-in-aid for historic preservation.

Department of Housing and Urban Development

The Department of Housing and Urban Development (HUD) provides assistance to communities in planning and development to include community development block grants.

State Agencies

Agencies of both states guide and regulate conservation and water resources development projects.

North Carolina

In North Carolina, the Department of Natural Resources and Community Development through its several agencies assists in the planning, permitting, conservation and use of water resources. This agency handles projects for water supply, flood control, pollution control, fish and wildlife enhancement, parks and recreational facilities, forest management, navigation and beach erosion. The Department of Human Resources assists and approves all projects providing public drinking waters.

South Carolina

In South Carolina, the Water Resources Commission sets priorities and assists in planning water developments, the Department of Health and Environmental Control is responsible for water quality, the Land Resources Conservation Commission coordinates work of districts and a wide variety of programs including mining and the Wildlife and Marine Resources Department provides assistance in fish and wildlife development and protection. The Department of Parks, Recreation and Tourism assists in recreational developments.

Regional and Local Governments

The states are divided into regions for coordination. County and municipal governments are also active.

Regions

The councils of government which cover all of the basin area provide coordination for federal programs being employed in the regional groupings of counties.

Local Governments

County and municipal governments provide local sponsorship for many water resource developments. They often provide local funds to match federal monies.

Districts

Both states have laws that provide enabling legislation for the formation of special purpose districts. Some of these include soil and water conservation districts, watershed districts and drainage districts. Districts usually provide local sponsorship for carrying out conservation and development projects.

PROGRAM DEVELOPMENT OPPORTUNITIES

This section describes possible combinations of local effort and federal programs that might be used to install certain elements of the alternatives. The elements analyzed are those recommended by this study for inclusion in a plan of development for the basin. Elements are identified as ED or EQ.

Table 3-1 is a summary of USDA program opportunities for acceleration of conservation and development in the basin. The table includes plan elements from both the economic development (ED) alternative and the environmental quality (EQ) alternative. Several plan elements contribute to improving both economic development and environmental quality. The alternative of most importance for each plan element is designated. Figure 4E-1 shows the location of project type action recommended for implementation. Sources of data for Table 3-1 include eight special reports, interviews with other agencies, and field studies. If further details concerning these data are desired, contact the River Basin Planning Staff, Soil Conservation Service, Columbia, South Carolina.

TABLE 3-1: OPPORTUNITIES FOR UTILIZING USDA PROGRAMS
TO ACCELERATE NEEDED PLAN ELEMENTS

YADKIN-PEE DEE BASIN

Component Needs Plan Elements (Alternative)	Source of Funds							
	USDA							
	PL-46	PL-566	RC&D	ACP	CFM	FIP	Other 1/	Total
	($1,000 annually) 2/							
Reduction in Sheet and Rill Erosion								
Adequately treat cropland and pasture-land (EQ)	240	170	35	320			600	1,365
Improve site preparation methods of forest land (EQ)	10	20	5	155	170	200	800	1,360
Reduction in Critical Area Erosion								
Treat gullies (EQ)	10	30	5	15	10		50	120
Stabilize roadbanks (EQ)	20	120	10				170	320
Stabilize logging roads and skid trails (EQ)		20		10	30		140	200
Stabilize construction sites (EQ)	60		10				530	600
Reduction in Loss of Prime Farmland								
Improve land use planning (EQ)	2	1	2				20	25
Use tax incentives (EQ)	1		1				10	12
Identify and map prime farmland (EQ)	10						10	20
Reduction in Loss of Prime Forest Land								
Improve land use planning (EQ)	1				2		6	9
Use tax incentives (EQ)	1				1		4	6
Identify and map prime forest land (EQ)					4		4	8
Protection of Wetlands								
Protect wetlands during construction (EQ)	2	5	4				10	21
Improve land use planning (EQ)	2	1	1		1		10	15
Avoid development of wetlands (EQ)	2	2	2		1		10	17
Improvement in Visual Quality								
Improve land use planning (EQ)	2	1	1		2		4	10
Treatment of cropland and critical areas (EQ)								3/
Improved forest harvesting methods (EQ)					2		4	6
Protect visual corridors (EQ)	2	1	1		2		6	12
Protection of Historical and Archeological Sites								
Survey sites before construction (EQ)	1	1	1		1		1	5
Protect sites during construction (EQ)	1	1	1		1		1	5
Preserve or salvage values (EQ)		1					2	3
Increased Production of Wood Fiber								
Planting trees (ED)	20	10	2	188	168	1,200	900	2,488
Timber stand improvement (ED)	20	10	2	40	220	300	600	1,192
Reduction in losses (ED)	10	1			110		200	321
Salvage of wasted wood (ED)	10	1			50		200	261
Storage of Irrigation Water								
Construction of reservoirs (ED)	60	1	2	200			500	763
Reduce Floodwater Damage to Crops in Mountains and Piedmont								
Change to less intensive use (ED)	4	1	1				40	46
Floodwater retarding dams (ED)		294					112	406
Channel restoration (ED)	4	1	1				50	56
Reduce Wetness Problems on Coastal Plain Cropland								
Change to less intensive land use (ED)	4						50	54
On-farm water management systems (ED)	10		2	360			423	795
Construct main channels (ED)		132	18				87	237
Reduce Floodwater Damages in Built-up Areas in Communities								
Avoid development in flood plain (ED)	3						6	9
Change land to less intensive use (ED)	2						6	8
Nonstructural measures (EQ)	4	10					60	74
Floodwater retarding dams (ED)		200					100	300
Main channels (ED)		70	10				50	130
Channel restoration (ED)	2						30	32
Sites for Water Storage								
Construct reservoirs (ED)							*	4/
Improve Fishing Opportunities								
Improve farm pond management (ED)	5		1				150	156
Develop stream access points (ED)	1		5				14	20
Improve Hunting Opportunities								
Improve upland habitat (ED)	18		2				590	610
Improve wetland habitat (ED)	3		1				181	185
Purchase Additional Land and Develop Recreational Areas								
Acquire land for parks (ED)							*	4/
Develop water-based recreational areas (ED)		60					49	109
TOTALS	547	1,127	126	1,288	775	1,700	6,825	12,388

1/ Other funds include Cooperative Extension, Farmers Home Administration loans, state, county and local governments; individu property owners; and federal funds other than USDA.

2/ For the land treatment elements, a 10 year installation period is assumed. A 20 year installation period is assumed for other elements. Annual costs were derived by dividing the total estimated cost by 10 or 20, as appropriate. This annual c is not to be confused with an amortized cost over the life of a project using a discount rate. Annual costs used in this t are for annual budget planning.

3/ Costs included in erosion control.

4/ Costs not estimated - *indicate possible sources of funds.

5/ See Section 4E for additional information.

CHAPTER 4
ALTERNATIVES

This chapter presents alternative courses of action that might be selected for implementation by citizens of the Yadkin-Pee Dee Basin for resolving the water and related land resource problems identified in Chapter 1. The time frame for the alternatives is assumed to be from the present until the year 2000. This 20 year period is referred to as the "early action" period.

Three alternatives are presented. First, an alternative called the "future without" condition is based on the assumption that ongoing trends in resource use and production will continue, no additional federal projects will be installed in the basin, and no acceleration of ongoing programs will occur. This alternative will be used as a bench mark for comparing the impacts of any proposed projects and programs.

Two alternatives to the "future without" condition were developed with the primary goal of improving the well-being of the people living in the area. One alternative is designed to promote economic development (ED) and the other is designed to add to environmental quality (EQ). Projections of demand for agricultural commodities, population changes, soil resources and capabilities, changes in technology and other factors were considered in preparation of alternatives. The plan most likely to be selected would include the most desirable parts of the alternatives.

Alternatives were developed with participation by groups and individuals throughout the basin. Personal contacts were made with councils of government, soil and water conservation districts, special interest groups, officials of all levels of government and interested individuals. The Citizens Advisory Committees organized primarily as the public participation arm of the "Level B" Study also helped guide this study. Comments made by reviewers of the reports already published were helpful in arriving at elements to be included in the alternatives.

4A - "FUTURE WITHOUT" CONDITION

The first alternative considered is future conditions in the basin without implementation of a plan affecting resource use and management. Estimates of the "future without" condition will provide a bench mark for evaluation of proposed projects and programs included in Alternative B - Economic Development and Alternative C - Environmental Quality. The eight problems identified in Chapter 1 are used as a basis for describing the "future without" condition. Component needs are defined as the remaining problems that will not be solved by ongoing programs during the early action time period.

I. Soil Erosion and Resulting Sedimentation

Erosion within the basin is expected to show a gradual decline under the going programs until the year 2000. Present erosion rates are most severe on cropland with slopes greater than five percent. Samplings in several hydrologic units or sub-basins indicated that approximately 80 percent of the cropland with slopes exceeding five percent needs treatment. The majority of this land is within the Southern Piedmont Major Land Resource Area. Anticipated treatment by going programs and changes in cropping patterns by the year 2000 are expected to reduce the percentage of such land needing treatment from 80 percent to 60 percent. Erosion on other cropland is expected to continue at approximately its present rate. By the year 2000, erosion from cropland is estimated to be 15 million tons annually. Roadbank erosion is expected to decrease steadily as treatment is installed by present programs and will average four million tons for the next 20 years.

The most severe consequences of continued erosion will be after the year 2000. Past history shows soils that are severely eroded are lost to crop production. As fields are gullied and soil is lost, production is decreased and the use of farm equipment is limited. Once the productive capacity is lost, most soils can not be restored to crop production.

Erosion is not a problem on undisturbed forest land. It can become a problem, however, during logging operations or on sites undergoing mechanical preparation for tree planting or direct seeding. Any disturbance of the organic cover or woody debris on the soil surface will expose mineral soil to erosive action of rainfall. In the past, logging roads and skid trails have been identified with the highest per acre erosion rates among all forestry activities occurring in the basin. Mechanical site preparation accounted for the next highest rate of erosion. These forestry activities had a more pronounced effect on erosion losses in the Blue Ridge and the Southern Piedmont areas than in areas of lesser topographic

relief. The States of North Carolina and South Carolina have selected practices to be included in a voluntary system set up to encourage forest landowners to reduce erosion on their respective properties. These practices, referred to as best management practices, are designed to mitigate the effect of disturbances created by forestry activities. If the voluntary system is successful, there should be a reduction in soil losses and consequently, a lower incidence of water pollution from sediment and soil nutrients.

Streambank erosion is expected to continue at the present rate. Erosion on urban land will remain about the same on areas already developed. Erosion will be significant on newly developing areas, but will be temporary in nature. Annual soil loss from urban and other nonagricultural land is estimated to average 1.2 million tons over the next 20 years.

Water quality is expected to improve slowly as sediment concentrations and pollutants associated with sediment decrease. Land treatment measures will reduce sediment as well as retain nutrients and pesticides on the land. Sediment pollution reduction will be directly proportionate to the land treatment accomplished by going programs. The accumulation of sediment in major reservoirs is expected to decrease slightly as land treatment measures are applied. This will not be evident by the year 2000 as the streams will pick up additional sediment from stream channel banks and bottoms.

The quality and quantity of the freshwater fishery habitat in the Yadkin-Pee Dee River Basin is presently adequate to meet the desires of most of the public. Under the "future without" condition, several problems can be projected. Water resource developments must be designed to preserve instream flows sufficient for freshwater fisheries habitat. Sediment resulting from erosion becomes a major threat to the quality of the fishery habitat. Sediment both disturbs fish beds and carries with it pollutants which degrade water quality. The two major sources of sediment are cropland and roadside erosion. Encroachment by a growing population will tend to reduce the quantity of fishery habitat. This will aggravate the sediment problem, as well as increase the pollutants which are discharged through storm sewers or treatment plants. The proliferation of certain weeds in lakes and ponds has become a nuisance to fishermen, as well as a detriment to fishery habitat. Some weeds, such as alligator weed, seem to have no consistent natural enemies. Weed problems will probably increase in the future demanding a greater need for biological and chemical control methods. Municipal and industrial wastes, as well as wastes from livestock operations are growing problems affecting water quality and fishery habitat quality. Under statewide water quality management plans, wastes from

these sources will be under control during the early action period. Even so, as the human population increases, pollution problems are magnified and total costs of treatment go up. Upstream pollution from point and nonpoint sources poses a threat over the coastal area of the basin. Sediment, agricultural chemicals and municipal and industrial wastes will cause damages to coastal and estuarine fishery resources. As sediment loads in water are reduced, quality of the coastal and estuarine resources will gradually improve.

II. Loss or Degradation of Resources

Urban growth associated with increasing population will take over productive cropland and forest land. This change in land use, an annual loss of 4,700 acres, forces crop and timber production to shift to less productive sites. An additional shift in forest land will occur as timberland is cleared to balance out the loss in cropland. The shift of agricultural and timber production to less productive sites means greater per unit production costs for food, fiber and forest products. Forest stands, at all ages, provide habitat for a wide range of wildlife species, both game and nongame species. Timber harvesting does not eliminate wildlife habitat; it simply creates conditions that favor another group of wildlife species. There is flexibility in managing timber stands to meet landowner objectives for wildlife habitat.

The list of threatened and endangered species already containing about 100 plants and animals[1/] could increase if proper precautions are not taken. Timber harvesting operations could result in destruction of habitat for certain species if these areas are not identified and protection methods employed. Acreages of high quality forested wildlife habitat including 1.3 million acres of wetlands[2/] will decrease during the period 1980 to 2000. Most of this loss will be due to an increase in urban and built-up areas and land clearing for crop production. There will be a change in species supported as hedgerows and timber are removed. Larger fields tend to decrease populations that depend on edge-type habitat for their food and protection. Land drainage changes the habitat for some wildlife. Tile drains tend to replace open ditches, thus reducing ditch bank habitat.

Urban sprawl and developing highway systems will continue to create an impact on the landscape. Where timber harvesting occurs along scenic roads and trails, the forested landscape

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1/ Report 6 (see front cover).
2/ Report 5 (see front cover).

will be disrupted unless adequate provisions are made for protecting scenic corridors. Several rivers in the basin have been nominated under the Wild and Scenic Rivers Act. If accepted, rivers under this program could be protected in their natural state.

Neglect of archeological and historical sites is resulting in deterioration of some sites. Additional sites are destroyed by development. Both states have programs with professional staffs to identify and record the locations of the most important sites. Public apathy and insufficient numbers of highly trained persons in the archeological/historical profession have delayed the identification and protection of sites.

III. Future Shortage of Wood Fiber

The "future without" condition is based on the assumptions that management will reflect prevailing practices and that there will be no acceleration of reforestation and no extensive use of fertilizers. Because of increasing demand for converting forest areas to agricultural production and to urban development, acreage in timber will gradually decline. Recent forest surveys conducted in North and South Carolina show a decline in forest acreage of three percent in 10 years[1/]. This trend will continue in the future.

Management practices carried out during the past two to three decades will assure a continued increase in timber volume in spite of a declining forest land base. This increase, however, will reach a peak around the year 2000.

Although net annual growth volumes appear to be sufficient to meet future market demands, the wood volume actually expected to be available for market consumption is less than projected demands. This deficit is expected to be 64 million cubic feet by 2000. The projected annual supply, demand and shortage of raw wood are shown in Table 4A-1.

IV. Frequent Yield and Income Loss Due to Drought

The cycle of wet and dry years will continue to impact heavily on basin productivity. The agricultural sector does not now possess the equipment or storage capacity to irrigate on a large scale. By the year 2000, an estimated 95,000 acres will be irrigated. This will require about 95,000 acre feet of water. Supplies of water must be in proximity to the fields to be irrigated. The present supply plus that which will be

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1/ Report 5 (see front cover).

TABLE 4A-1: PRESENT AND PROJECTED ANNUAL SUPPLY, DEMAND AND SHORTAGE OF RAW WOOD

YADKIN-PEE DEE BASIN

	Present	2000		
	Supply	Supply	Demand	Shortage
	(million cubic feet)			
North Carolina portion	142.0	195.2	221.3	26.1
South Carolina portion	115.5	185.3	223.5	38.2
Yadkin-Pee Dee Basin	257.5	380.5	444.8	64.3

SOURCE: Report 5 (see front cover).

developed without a plan will amount to 75,000 acre feet. This leaves a deficit of 20,000 acre feet under continued conditions. Table 4A-2 shows the projected acres to be irrigated, water requirements, supply and shortage of irrigation water for the year 2000.

Irrigation water users should provide on-farm storage reservoirs for water supplies. Since stream flows are usually minimal at the time the need for irrigation is greatest, they do not provide a dependable supply of water.

V. Frequent Crop Loss Due to Flooding and Wetness

Floodwater damages will continue in the mountain and piedmont portions of the basin throughout the planning period. As the pressures for agricultural products increase, more crops will be planted in the flood plains. By the year 2000, floodwater damages will be greater than under present conditions. The average annual floodwater damage to agricultural property and crops by the year 2000, is estimated to be $4,700,000.

In the Coastal Plain portion of the basin which includes the Carolina and Georgia Sand Hills, the Southern Coastal Plain and the Atlantic Coast Flatwoods Major Land Resource Areas, the primary problem is wetness of cropland. Wetness delays crop planting and harvesting which results in lower yields and decreased product quality. Wetness problems will continue throughout the planning period. Some areas will be treated by systems of channels and tile drains, while systems in other areas will deteriorate to a point of being ineffective. The trend to larger machines and larger fields will place additional stress on the water management systems. The expense and coordination required for group-type projects will hamper their installation. The present rate of ongoing programs will fall short of the needed improvements in water management. Even so, there will be an improvement in the status of water management over present conditions. By the year 2000, average annual losses due to excess wetness are estimated to be $22,600,000.

VI. Floodwater Damage to Nonagricultural Properties

Flooding has been identified as a problem in 154 communities. Damages vary from nuisance flooding, such as yards and roads to severe flooding where buildings, roads and other properties are destroyed. Through the planning period, programs to reduce the loss from flooding will have a major effect. Many communities will zone areas to prevent development. Some structures will be flood proofed or moved out of the flood zone. Flood insurance can offset financial losses resulting from flood damages for those enrolled in the flood insurance program.

TABLE 4A-2: IRRIGATION - HISTORICAL AND PROJECTED

YADKIN-PEE DEE BASIN

Item	Present (1979)			2000		
	North Carolina	South Carolina	Basinwide	North Carolina	South Carolina	Basinwide
	(1,000)					
Irrigated Acres	23	16	39	50	45	95
Water Requirements (acre-feet)	23	16	39	50	45	95
Supply with Going Programs (acre-feet)	23	16	39	37	38	75
Shortage (acre-feet)	-	-	-	13	7	20

SOURCE: Report 8 (see front cover).

Generally, the trend toward ever-increasing floodwater damageable values will be lessened and in many communities will even be on the decrease.

VII. Shortage of Community Water Supply

Agencies of state government, multi-county councils of government, county governments and local governments are responsible for anticipating future water needs for communities. The federal role is limited in this effort.

VIII. Undeveloped Recreational Resources

Since population is projected to increase by about one-third during the 1976-2000 period in both portions of the basin, substantial increases in the need for recreational facilities are also projected[1/]. Requirements for Class I uses in the year 2000, are estimated to be about 6,000 and 3,000 acres, in the North Carolina and South Carolina portions, respectively. Corresponding needs for Class II recreational uses are about 28,000 and 11,000 acres, respectively. Ongoing state recreational programs will provide about 70 percent of the funds needed for land purchase of a remaining need of about 14,000 acres of Class I and II recreational land. These estimated requirements for recreational uses of land in the future can be in conflict with requirements for land to produce food and fiber needs, particularly in the South Carolina portion. Resource use planning will be helpful in identifying tradeoffs among these and other competing uses for land in the future.

Streams throughout the basin offer fishing opportunities, if access were available. With improved planning, many areas of wildlife habitat could support additional hunting days. Even though there are numerous bodies of water that may be used for recreation, the development of recreational opportunities does not coincide with the distribution of population. This causes a shortage in certain areas.

Summary "Future Without" Condition

Table 4A-3 shows a summary of the "future without" condition expressed in component needs. Needs may be defined as desired outputs and are derived by estimating the untreated problems at the end of the planning period. Simply stated, needs are projected problems less contributions of ongoing programs.

1/ Report 2 (see front cover).

TABLE 4A-3: SUMMARY - ALTERNATIVE A
"FUTURE WITHOUT" CONDITION

YADKIN-PEE DEE BASIN

Problems/ Component Needs	Unit	Extent
I. Soil Erosion and Resulting Sedimentation		
A. Reduction in Sheet and Rill Erosion	million tons/yr.	16.4
B. Reduction in Critical Area Erosion	million tons/yr.	5.6
C. Reduction in Sedimentation		basinwide
II. Loss or Degradation of Resources		
A. Reduction in Loss of Prime and Important Farmland	ac./yr.	2,000
B. Reduction in Loss of Prime Forest Land	ac./yr.	3,000
C. Protection of Wetlands	ac./yr.	900
D. Improvement in Visual Quality	ac./yr.	2,000
E. Protection of Historical and Archeological Sites	number	1/
III. Future Shortage of Wood Fiber		
Increased Production of Wood Products	million cu.ft./yr.	64.3
IV. Frequent Yield and Income Loss Due to Drought		
Shortage of Irrigation Water	1,000 ac.ft.	20.0
V. Frequent Crop Loss Due to Flooding and Wetness		
A. Reduce Floodwater Damages in the Mountains and Piedmont	$million/yr.	4.7
B. Reduce Wetness Problems in the Coastal Plain	$million/yr.	22.6
VI. Floodwater Damages to Nonagricultural Properties		
Reduce Floodwater Damages in Built-up Areas in Communities	number	154
VII. Shortage of Community Water Supplies		
Sites for Water Storage	number	2/
VIII. Undeveloped Recreational Resources		
A. Improved Fishing Opportunities	1,000 visitor days/yr.	115
B. Improved Hunting Opportunities	1,000 visitor days/yr.	82
C. Purchase Additional Land and Develop Recreational Areas	1,000 acres	14.0

1/ Not evaluated.
2/ See the U.S. Water Resources Council "Level B" Study.

TABLE 4A-3: SUMMARY - ALTERNATIVE A
"FUTURE WITHOUT" CONDITION

YADKIN-PEE DEE BASIN

Problems/ Component Needs	Unit	Extent
I. Soil Erosion and Resulting Sedimentation		
A. Reduction in Sheet and Rill Erosion	million tons/yr.	16.4
B. Reduction in Critical Area Erosion	million tons/yr.	5.6
C. Reduction in Sedimentation		basinwide
II. Loss or Degradation of Resources		
A. Reduction in Loss of Prime and Important Farmland	ac./yr.	2,000
B. Reduction in Loss of Prime Forest Land	ac./yr.	3,000
C. Protection of Wetlands	ac./yr.	900
D. Improvement in Visual Quality	ac./yr.	2,000
E. Protection of Historical and Archeological Sites	number	1/
III. Future Shortage of Wood Fiber		
Increased Production of Wood Products	million cu.ft./yr.	64.3
IV. Frequent Yield and Income Loss Due to Drought		
Shortage of Irrigation Water	1,000 ac.ft.	20.0
V. Frequent Crop Loss Due to Flooding and Wetness		
A. Reduce Floodwater Damages in the Mountains and Piedmont	$million/yr.	4.7
B. Reduce Wetness Problems in the Coastal Plain	$million/yr.	22.6
VI. Floodwater Damages to Nonagricultural Properties		
Reduce Floodwater Damages in Built-up Areas in Communities	number	154
VII. Shortage of Community Water Supplies		
Sites for Water Storage	number	2/
VIII. Undeveloped Recreational Resources		
A. Improved Fishing Opportunities	1,000 visitor days/yr.	115
B. Improved Hunting Opportunities	1,000 visitor days/yr.	82
C. Purchase Additional Land and Develop Recreational Areas	1,000 acres	14.0

1/ Not evaluated.
2/ See the U.S. Water Resources Council "Level B" Study.

4B - ECONOMIC DEVELOPMENT ALTERNATIVE

The economic development (ED) alternative is a set of management strategies best able to contribute to the satisfaction of the needs related to ED issues identified in the previous chapter.

The objectives of the ED alternative are: (1) to increase the value of the nation's output of goods and services, and (2) to improve economic efficiency. Components of the objectives are designed to increase outputs required to meet projected demands in ways that will improve farm income. Some ED components also contribute to improved environmental quality (EQ).

The elements of the ED alternative are based on desires expressed by people in the basin. The expressed desires are related to one or more of the problems that were identified by the state sponsoring agencies at the beginning of the study. Table 4B-1 is a summary of the elements and their extent in the ED alternative. Immediately following the table is an expanded explanation of elements considered.

It is projected agricultural production will increase to meet the basin's share of the nation's future requirements for food, feed, forage, oilseed crops and fiber. Major increases in demands of the basin are the production of soybeans, corn and hay. Increased production places greater demands on land and water resources. Plan elements in Table 4B-1 include means for protecting these resources for sustained production over an indefinite time period. Generally, measures that improve agricultural efficiency also decrease soil erosion. The primary analysis of improved agricultural efficiency is based on reduced costs per unit of production through proper land treatment and management practices. Other important national considerations include more efficient use of fertilizers and chemicals and savings in energy consumption. Erosion on cropland is the main target of land treatment in the ED alternative.

Wood fiber must be produced to support a market demand in 2000 of 445 million cubic feet. The projected supply is 381 million cubic feet for 2000, indicating a need for an additional 64 million cubic feet. It is essential that an accelerated forestry program become a part of any early-action plan as forest production requires a minimum of 35 to 40 years to reach harvest age.

I. Soil Erosion and Resulting Sedimentation

A. Reduction of Sheet and Rill Erosion

Erosion control practices in the ED alternative are designed to maintain soil productivity for future generations. Land treatment practices include those that will provide the greatest returns for each dollar spent for their installation. Other goals of land treatment in the ED alternative are reduced maintenance costs, enhancemnt of hunting and fishing opportunities and improvement of health, safety and living conditions. Treatment of cropland is the major part of the erosion control plan. Land in

TABLE 4B-1: SUMMARY - ALTERNATIVE B
ECONOMIC DEVELOPMENT

YADKIN-PEE DEE BASIN

Problems / Component Needs / Plan Elements	Unit	Extent
I. Soil Erosion and Resulting Sedimentation		
A. Reduction in Sheet and Rill Erosion	million tons/yr.	2.8
1. Adequately treat cropland and pastureland	1,000 ac./yr.	37.9
2. Improve site preparation methods on forest land	1,000 ac./yr.	5.0
B. Reduction in Critical Area Erosion		none
II. Loss or Degradation of Resources		
A. Reduction in Loss of Prime and Important Farmland		none
B. Reduction in Loss of Prime Forest Land		none
C. Protection of Wetlands		none
D. Improvement in Visual Quality		none
E. Protection of Historical and Archeological Sites		none
III. Future Shortage of Wood Fiber		
Increased Production of Wood Products	million cu.ft./yr.	64.3
1. Planting trees	1,000 ac./yr.	55.0
2. Timber stand improvement	1,000 ac./yr.	5.0
3. Reduction of losses from insects, diseases, wildfires and other causes	million cu.ft./yr.	4.0
4. Salvage of wasted wood	million cu.ft./yr.	13.0
IV. Frequent Yield and Income Loss Due to Drought		
Storage of Irrigation Water	1,000 ac.ft.	20.0
Construction of reservoirs	number	580
V. Frequent Crop Loss Due to Flooding and Wetness		
A. Reduce Floodwater Damages in the Mountains and Piedmont	$million/yr.	1.2
1. Change land to less intensive use	1,000 acres	4.5
2. Floodwater retarding dams	number	23
3. Channel restoration	miles	86
B. Reduce Wetness Problems in the Coastal Plain	$million/yr.	5.9
1. Change land to less intensive use	1,000 acres	35.5
2. On-farm water management systems	1,000 acres	280.0
3. Construct main channels	miles	264.0
VI. Floodwater Damages to Nonagricultural Properties		
Reduce Floodwater Damages in Built-up Areas in Communities	number	154
1. Avoid future development in flood plain	number	154
2. Change land to less intensive use	acres	500
3. Floodwater retarding dams	number	12 1/
4. Construct main channels	miles	16 2/
5. Restore channels by moving debris and sediment	miles	18 3/
VII. Shortage of Community Water Supplies		
Sites for Water Storage	number	4/
VIII. Undeveloped Recreational Resources		
A. Improved Fishing Opportunities (visitor days)	1,000/yr.	115
1. Improve farm pond management	number/yr.	1,200
2. Develop stream access points	number/yr.	21
B. Improved Hunting Opportunities (visitor days)	1,000/yr.	82
1. Improve upland habitat	1,000 ac./yr.	16.5
2. Improve wetland habitat	1,000 ac./yr.	3.5
C. Purchase Additional Land and Develop Recreational Areas	1,000 acres	14.0
1. Acquire land for Classes I and II parks	1,000 acres	14.0
2. Develop water-based recreational areas	number	3 5/

1/ Included in VA2.
2/ Included in VB3.
3/ Included in VA3.
4/ See the U.S. Water Resources Council "Level B" Study.
5/ Included in VA2.

Capability Classes IIIe, IVe and VIe with slopes ranging from 6 to 25 percent, mostly in Piedmont North Carolina, will be the primary target for treatment.

1. Adequately treat 37,900 acres of cropland and pastureland annually

   Treatment of cropland and pastureland is normally accomplished by the establishment of a combination of practices referred to as treatment systems. Any number of systems may be developed to meet the needs of a given field or erosion problem. The following list covers the most practical systems:

   a. System A - grassed waterways and terraces. Other practices usually include contour farming, crop rotations, field borders and crop residue management.

   b. System B - grassed waterways and contour farming. Other practices usually include crop rotation, field borders and crop residue management.

   c. System C - conservation tillage. Other practices usually include contour farming, crop rotation and field borders.

   d. System D - contour strip cropping. Other practices usually include crop residue management and field borders.

   e. System E - crop residue management and windbreaks. Other practices usually include chiseling, crop rotation and field borders.

   f. Change use from crops to pasture - Change land in Classes IVe and VIe from crops to grass.

   g. Pasture improvement - Management of pasture includes fertilizing, liming, weed control, rotational grazing and watering facilities.

   (See Table 4B-2 for extent of plan elements.)

TABLE 4B-2: EROSION CONTROL MEASURES
ALTERNATIVE B - ECONOMIC DEVELOPMENT

YADKIN-PEE DEE BASIN

Plan Elements Measures	North Carolina Portion		South Carolina Portion		Total Basin	
	Annual Amount (1,000 Acres)	Annual Cost ($1,000)	Annual Amount (1,000 Acres)	Annual Cost ($1,000)	Annual Amount (1,000 Acres)	Annual Cost ($1,000)
1. Adequately treat cropland and pastureland						
a. System A	0.7	35.0	0.4	20.0	1.1	55.0
b. System B	6.0	180.0	1.0	30.0	7.0	210.0
c. System C	15.0	315.0	5.0	105.0	20.0	420.0
d. System D	1.7	17.0	0.3	3.0	2.0	20.0
e. System E	2.0	40.0	3.0	60.0	5.0	100.0
f. change use from crops to pasture	1.0	100.0			1.0	100.0
g. pasture planting or replanting	0.7	70.0	0.2	20.0	0.9	90.0
h. pasture improvement	0.7	49.0	0.2	14.0	0.9	63.0
2. Improve site preparation in forest land	3.0	300.0	2.0	200.0	5.0	500.0

2. Improve site preparation methods on forest land

The States of North Carolina and South Carolina have developed plans that enlist the cooperation of forest landowners in carrying out the best management practices (BMPs) in mechanical preparation of sites for tree planting and the cooperation of logging contractors in using BMPs in construction, use and maintenance of logging roads and skid trails. These BMPs will be applied to the most severely eroding areas at the rate of 5,000 acres annually.

II. Loss or Degradation of Resources

(No plan elements included in the ED Alternative.)

III. Future Shortage of Wood Fiber

A. Increased Production of Wood Products

The goal in ED is to increase the production of wood grown on forest lands in the basin. Forest lands in the North Carolina portion and the South Carolina portion can be used more efficiently, not only for the production of timber, but for the other uses important to the people of the Yadkin-Pee Dee Basin. Economic growth can be measured by the increase of wood fiber volume needed to meet the demand for such products as sawlogs, veneer logs, pulpwood, posts, piling, and other forest products.

Efforts to achieve this growth should be directed first to the highly productive forest sites and then to the lesser productive sites as circumstances dictate. Reasonable goals for ED within the next 20 years include:

1. Tree planting

Tree planting or direct seeding is needed on 65,000 acres annually. Trees will be planted on some idle cropland, but most of the reforestation will take place on clear-cut forest land. The dominant species will be pine.

2. Timber stand improvement

Timber stand improvement is needed on about 734,000 acres. Annual goals for timber stand improvement in the ED Alternative are 35,000 acres per year. This amount is about equally divided between the two states.

3. Reduction in losses from insects, diseases, wildfires and other causes

Reduction in losses from insects, diseases, wildfires and other causes may be brought about by education, research and technical assistance. Salvage of damaged trees could reduce annual timber waste. Improved utilization will result in the recovery of 2.5 million cubic feet of wood fiber annually.

4. Salvage of wasted wood

The ED goal is to recover at least 50 percent of the wood fiber volume found in rough and rotting trees, logging residue, and trees removed in land clearing and timber stand improvement work. This salvage will amount to 17 million cubic feet of wood each year.

IV. Frequent Yield and Income Loss Due to Drought

Storage of Irrigation Water

During the next 20 years, about 20,000 acre feet of water storage should be provided to meet the needs of increased irrigation. This is in addition to the amount provided as a part of the ongoing programs. Most storage of this water should be created in small reservoirs on farms near the fields where the water is needed. In the North Carolina portion of the basin, about three-fourths of the reservoirs could be created by the construction of dams. The remainder could be dug pit reservoirs. It is estimated one-third of the dug pit reservoirs would be supplemented by a well.

In the South Carolina portion of the basin, more than half of the reservoirs would be dut pits with about one-third of these supplemented by a well. The remainder would be reservoirs created by dams. The average reservoir would provide about six acre feet of water. Each reservoir would be designed for the desired area to be irrigated. As a rule-of-thumb, each acre to be irrigated requires the storage of an acre foot of water.

Construction of reservoirs

Based on an average storage capacity of 35 acre feet each, 580 reservoirs would be constructed to provide 20,000 acre feet of irrigation water. Reservoir storage capacity would range from three acre feet for specialty crops to 700 acre feet for large farms.

Future wood fiber production depends on planting trees, improving timber stands, reducing forest fires, insects and diseases and salvaging wasted wood.

Drainage is a way of life in the
Southern Coastal Plain and Atlantic Coast Flatwoods
Major Land Resource Areas.

On-farm drainage systems help overcome wetness problems.

V. Frequent Crop Loss Due to Flooding and Wetness

A. Reduce Floodwater Damages in the Mountains and Piedmont

In the Mountains and Piedmont portion of the basin (MLRAs 130 and 136, Figure IN-1), floodwater damages occur in flood plains along small streams, as well as large rivers. Agricultural damages are widespread.

1. Change land to less intensive use

The first increment for the reduction of floodwater damages is the removal of damageable values. Cropland that is regularly damaged by floods may be changed to pasture or forest, so the chance of loss would be less. During the next few years, 4,500 acres of flood plain now in crops could be changed to other uses. This could be brought about through information programs and land use planning assistance.

2. Floodwater retarding dams

Preliminary estimates indicate 23 dams could be constructed to provide flood protection to flood plain land presently in crops and other intensive uses. These 23 dams could be constructed in four mini-basins, as shown in Table 4B-3.

3. Channel restoration

Floods may be reduced in selected areas by the removal of debris and sediment from channels. The ED Alternative includes 86 miles of channel restoration for reduction of flood damages to cropland. No attempt was made to locate these areas on a map, since they would be widespread with the average installation not exceeding one mile in length.

B. Reduce Wetness Problems in the Coastal Plain

In the Coastal Plain portion of the basin (MLRAs 133, 137 and 153, Figure IN-1) problems created by excess water on flat fields and other areas account for major losses each year. These problems are a combination of flooding and wetness. In this study, the assumption is made that the problems of flooding and wetness are inseparable and for simplicity are referred to as wetness.

TABLE 4B-3: POTENTIAL FLOODWATER RETARDING DAMS
ALTERNATIVE B - ECONOMIC DEVELOPMENT

YADKIN-PEE DEE BASIN (North Carolina Portion)

Subbasin Mini-basin No. - Name	County(ies)	Potential Dams (Number)	Installation Cost ($1,000)
Upper Yadkin			
110 - Ararat River	Surry, Yadkin	4	4,000
140 - Forbush-Logan Creeks	Yadkin	2	1,200
Lower Yadkin			
010 - Tri Creek	Rowan	4	4,000
Rocky			
028 - Coddle, Coldwater, Dutch Buffalo Creeks	Cabarrus, Rowan, Iredell	13	5,000

1. Change land to less intensive use

In the Coastal Plain, some areas now in crops should be changed to a less intensive use such as pasture or forest. These areas are usually soils that do not respond to modern farming techniques or are too far from a drainage outlet. During the next few years, 35,500 acres should be removed from crop production. This could be accomplished through improved land use planning.

2. On-farm water management systems

The measures that will do the most toward reducing wetness problems in the Coastal Plain are on-farm water management systems. These systems include a combination of land forming, open ditches and tile drains. The ED Alternative includes 280,000 acres to be treated by these systems. This can be accomplished through individual efforts supported by technical and cost-share assistance.

3. Construct main channels

After on-farm systems have been used to their maximum extent and where individual farmers can not find adequate outlets to dispose of excess water, group action is the most practical solution. Open ditches are the primary measured used by groups for community water disposal systems. An estimated 264 miles of main channels could practically be installed during the early action period. This could be accomplished by groups working together with help provided for planning and design and cost-sharing assistance for construction. Table 4B-4 shows areas where group jobs could be installed. (See Figure 4B-1 for the location of areas with water management problems.)

VI. Floodwater Damages to Nonagricultural Properties

Reduce Floodwater Damages in Built-up Areas in Communities

Built-up areas in flood plains present a special problem since large investments are often made for buildings, equipment and inventory in these areas. Another consideration is the frequent floods that cause damage to urban areas. The goal of the ED Alternative is to reduce floodwater damages in the most practical manner. Measures for flood prevention vary among damageable areas.

TABLE 4B-4: REDUCTION OF WETNESS PROBLEMS
ALTERNATIVE B - ECONOMIC DEVELOPMENT

YADKIN-PEE DEE BASIN

Subbasin Mini-basin No. - Name	County(ies)	Affected Area (1,000 Acres)	Potential Main Channels (Miles)	Installation Cost ($1,000)
Lower Pee Dee				
150 - Smith Swamp	Marion	4.0	9	242.0
Lynches				
110 - Carter Creek	Florence, Sumter	13.0	8	215.0
130 - Big Swamp	Florence	3.9	6	161.4
140 - Salem Community	Florence, Williamsburg	5.0	5	134.0
Lumber				
030 - North West Pembroke	Robeson	3.0	5	137.0
050 - Upper Bear Swamp	Robeson	4.0	17	440.0
050 - Moss Neck	Robeson	4.2	19	950.0
060 - Raft Swamp	Hoke, Robeson	5.4	17	468.0
130 - Ten Mile Swamp	Robeson	2.5	8.5	213.0
180 - Ashpole Swamp	Robeson	3.3	13	328.0
Little Pee Dee				
040 - Buck Swamp-Reedy Creek	Dillon, Marion, Marlboro	8.0	12	323.0
060 - Cartwheel Community	Horry	4.2	10	269.0
070 - Lake Swamp	Horry	7.8	15	403.0
080 - Reedy Creek	Marion	6.7	7	188.3
Black				
030 - Upper Black River	Lee	5.1	15	403.0
070 - Kingstree Canal	Clarendon, Florence, Williamsburg	14.0	20	538.0
080 - Pudding Swamp	Lee, Sumter, Clarendon	23.0	14	376.0
090 - Stony Run	Williamsburg	3.4	5	135.0
098 - Ox Swamp	Williamsburg	1.2	3	86.0
110 - Black Mingo	Williamsburg	2.6	7	23.8
Waccamaw				
010 - Brown Marsh	Bladen	16.3	22	539.0
010 - White Marsh	Columbus	2.4	8	202.0
020 - North Lake Waccamaw	Columbus	0.7	3	82.0
120 - White Oak Swamp	Horry	5.9	11	296.0
140 - Brown-Grier Swamp	Horry	8.0	8	215.0

NOTE: See Figure 4B-1 for locations of mini-basins.

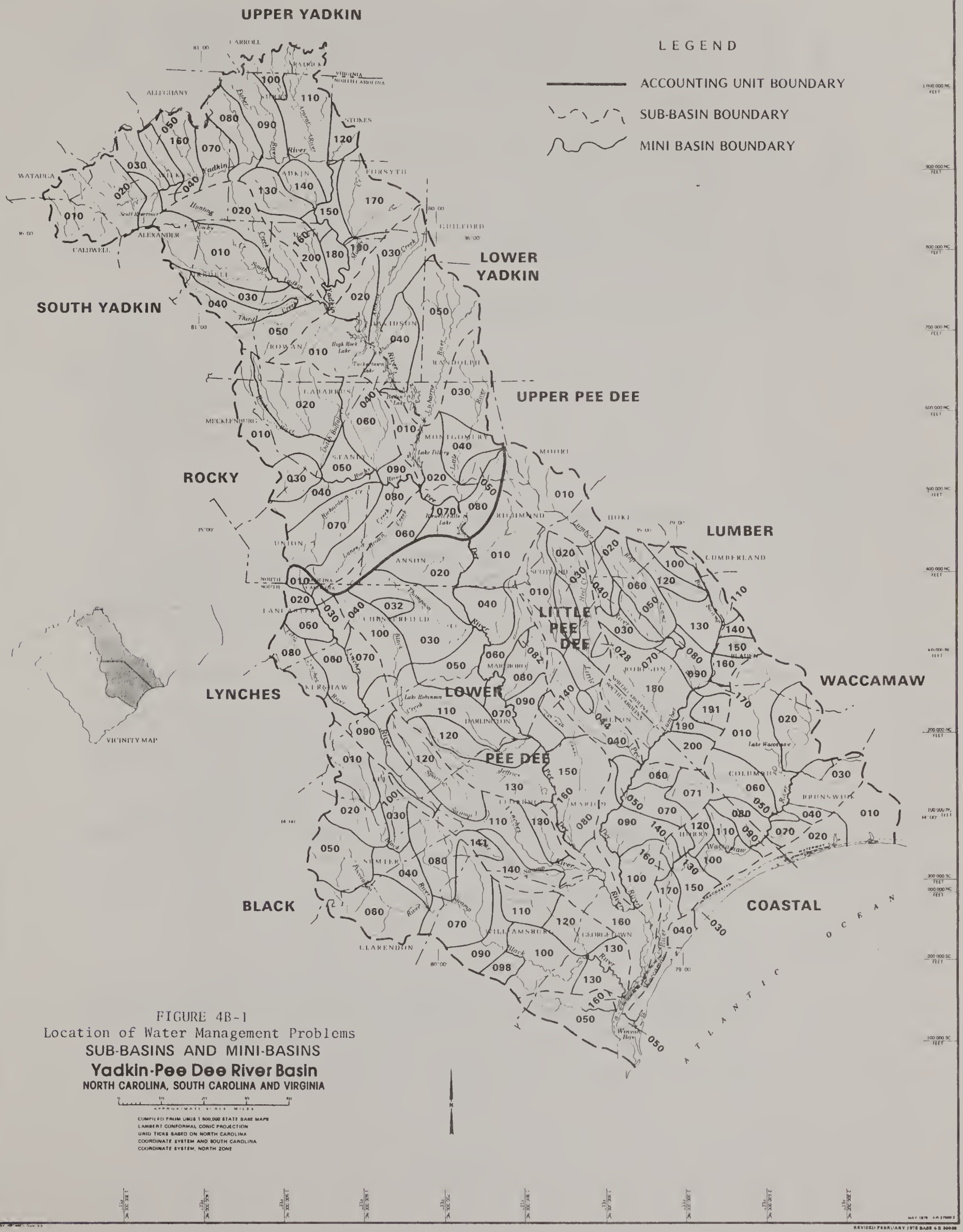

FIGURE 4B-1
Location of Water Management Problems
SUB-BASINS AND MINI-BASINS
Yadkin-Pee Dee River Basin
NORTH CAROLINA, SOUTH CAROLINA AND VIRGINIA

COMPILED FROM USGS 1:500,000 STATE BASE MAPS
LAMBERT CONFORMAL CONIC PROJECTION
UNIO TICKS BASED ON NORTH CAROLINA
COORDINATE SYSTEM AND SOUTH CAROLINA
COORDINATE SYSTEM, NORTH ZONE

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1. Avoid future development in flood plains

The most effective way to reduce floodwater damages is to avoid future development in flood prone areas. This may be accomplished through informational programs, flood plain management studies, land use regulations, and incentive or purchase programs.

2. Change land to less intensive use

Changing land use in urban areas is a slow and often expensive process. Changes in land use may be brought about by avoiding repairs to buildings and not rebuilding after flood losses.

3. Floodwater retarding dams

Dams for storing floodwater can be effective in selected areas. Generally, floodwater dams are used upstream from highly concentrated areas where other measures are not effective. Dams could be used for reducing damages in parts of Mt. Airy, Bannertown and Toast in Surry County and Salisbury in Rowan County.

4. Construct main channels

In the Coastal Plain, main outlet channels can be effective in removing storm water from urban areas. The ED Alternative includes outlet channels to help reduce flooding in communities, as listed in Table 4B-5.

5. Restore channels by removing debris and sediment

Channel restoration is an effective measure for controlling urban flooding where channel capacities have been reduced through sedimentation and clogging by trees and other debris. Locations of areas where channel restoration is practical were not mapped since these areas are generally less than one mile in length and are widespread.

VII. Shortage of Community Water Supply

Sites for Water Supply

The scope of this study included the evaluation of potential dam sites that could be used for any purpose. Report 7 was devoted to the evaluation of potential dam sites.

Three structures in the Coddle, Coldwater, Dutch Buffalo

TABLE 4B-5: REDUCTION OF FLOODWATER DAMAGES TO NONAGRICULTURAL AREAS
ALTERNATIVE B - ECONOMIC DEVELOPMENT

YADKIN-PEE DEE BASIN

Subbasin Mini-basin No. - Name	County(ies)	Community(ies)[1/]
Lynches		
110 - Carter Creek	Florence, Sumter	Danwood
140 - Salem Community	Florence, Williamsburg	Salem
Lumber		
030 - North West Pembroke	Robeson	Pembroke
050 - Upper Bear Swamp Canal	Robeson	Prospect
050 - Moss Neck	Robeson	Moss Neck, Mt. Airy, Sandy Plains, Green Pines
130 - Ten Mile Swamp	Robeson	Ten Mile, Magnolia
180 - Ashpole Swamp	Robeson	Raynham, McDonald, Purvis, Elrod
Little Pee Dee		
060 - Cartwheel Community	Horry	Cartwheel
080 - White Oak Creek, Buck Swamp, Reedy Creek	Marion	Mullins, Gapway, Rains
Black		
070 - Kingstree Canal	Clarendon, Florence, Williamsburg	Kingstree, Cades, Terrells Crossroads
090 - Stoney Run	Williamsburg	Carris, Bryans Crossroads
098 - Ox Swamp	Williamsburg	Taft Crossroads

1/ Includes unincorporated areas known for some landmark or meeting place.

Creeks mini-basin have been identified as needed in the near future for community water supply by the Soil Conservation Service in a draft plan and environmental impact statement prepared under authority of PL-566.

VIII. Undeveloped Recreational Resources

A. Improved Fishing Opportunities

Fishing opportunities could be improved through proper management and better public access.

1. Improve farm pond management

Ponds of all sizes and uses are found throughout the basin. The ED Alternative includes improved management of existing and new ponds. Irrigation reservoirs offer the greatest potential for increased fishery resource. Each year 1,200 additional ponds should be improved. This could be brought about by informational and technical assistance programs.

2. Develop stream access points

Access to many reaches along the basin's rivers is almost nonexistent. The ED Alternative includes 21 boat ramps and parking areas that could be installed near road crossings on the Lumber, Waccamaw, Little Pee Dee, Great Pee Dee and Lynches Rivers. These should be installed in addition to those expected through ongoing programs.

B. Improved Hunting Opportunities

Places to hunt will be more scarce in the future. The ED plan is aimed at helping to improve resources for game production.

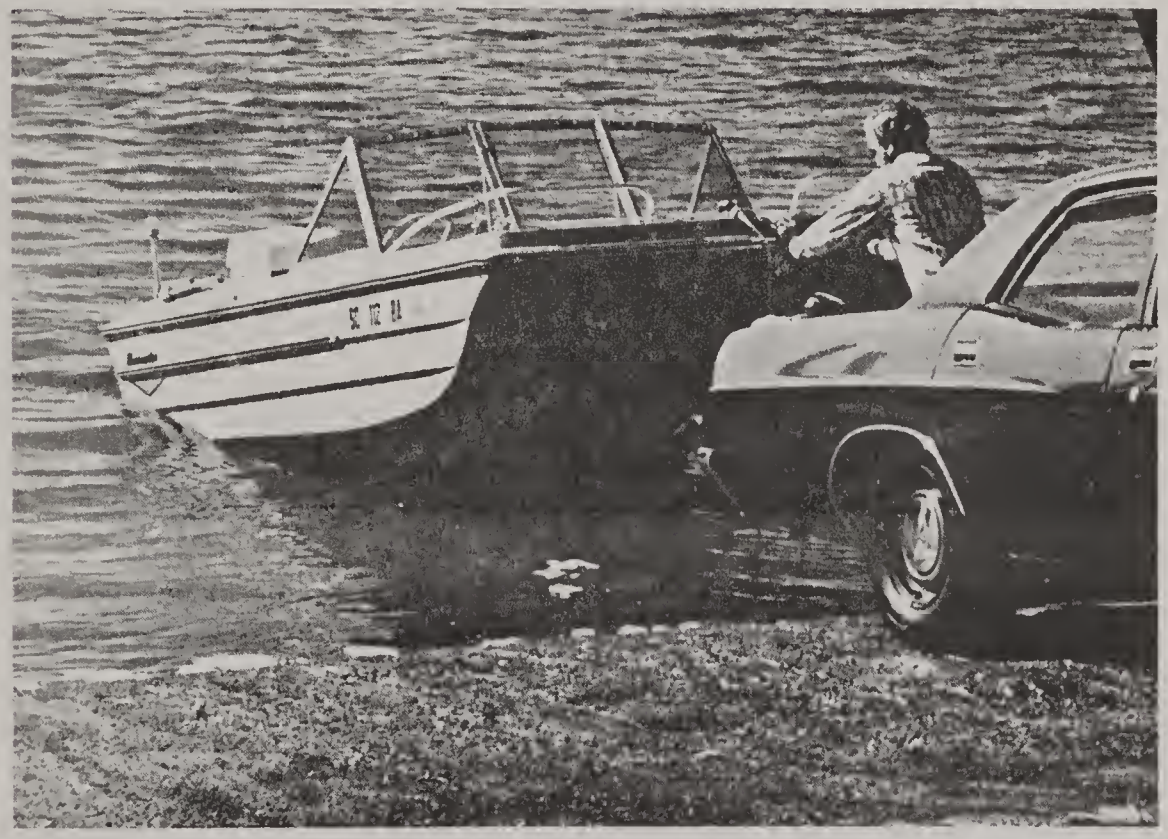
1. Improve upland habitat

At least 16,500 acres should be improved each year in addition to ongoing efforts. This could be brought about by improved technical and cost-share assistance.

2. Improve wetland habitat

An estimated 3,500 acres of wetland habitat could be improved each year through duck food plantings and other practices. This could be done by individual landowners with technical and cost-share assistance.

Pond management enhances fishing for recreation and food.



Boat ramps provide access to streams, lakes and ponds for all types of water activities.
(Photo furnished by S.C. Department of Wildlife and Marine Resources.)

C. Purchase Additional Land and Develop Recreational Areas

Competing demands for all funds result in shortages from the desired condition. This is especially true when recreational development is planned.

1. Acquire land for Class I and II parks

To meet minimum standards for recreational development in community size parks, 14,000 acres of land should be purchased. This is in addition to that expected to be provided by ongoing programs. Funds for land purchase might come from several federal agencies. Park development could be a part of a multiple purpose project.

2. Develop water-based recreational areas

At least three areas for fish and wildlife and other recreational activities could be developed in the near future. Additional areas will be needed later in the early action time period as population of certain areas grow.

4C - ENVIRONMENTAL QUALITY ALTERNATIVE

The environmental quality (EQ) alternative is a set of management strategies best able to contribute to the satisfaction of the needs related to EQ problems identified in the previous chapter. Contributions to EQ are identified by protection of, or improvement in the quality of natural and cultural resources including:

1. Water and land resources,
2. fish and wildlife resources,
3. archeological and historical resources, and
4. visual resources.

The EQ Alternative is designed to emphasize these values. Some elements are the same as those in the ED Alternative. Other elements are altered to decrease adverse environmental impacts. Elements that serve only EQ are also included. Table 4C-1 is a summary of Alternative C and shows plan elements that will help to meet component needs as identified in the "future without" condition, Alternative A.

The following is an expansion of the plan elements as they relate to component needs and major problems.

I. Soil Erosion and Resulting Sedimentation

A. Reduction in Sheet and Rill Erosion

The primary objective of erosion control in the EQ Alternative is water quality improvement through sediment reduction. Closely associated are improvements in fish and wildlife habitat, natural beauty and protection of the land resource base. The EQ Alternative provides intensive treatment and protection of eroding soil to reduce sediment delivered to lakes, streams, estuaries, flood plains, road ditches and other areas. Erosion control has a direct relationship to the amount of suspended sediment in receiving water.

1. Adequately treat cropland and pastureland

The most effective reduction in sediment can be brought about by treatment of open land. Systems of treatment are the most effective approach to cropland and pastureland treatment. The same systems as described under Alternative B - Economic Development, are employed in this plan element. The EQ Alternative provides for accelerated treatment of 49,000 acres of cropland and pastureland each year. Most of the land to be treated is found in the North Carolina Piedmont portion of the basin. This will result in a significant reduction in the amount of erosion in the basin. Table 4C-2 gives more information on the land treatment

TABLE 4C-1: SUMMARY - ALTERNATIVE C
ENVIRONMENTAL QUALITY

YADKIN-PEE DEE BASIN

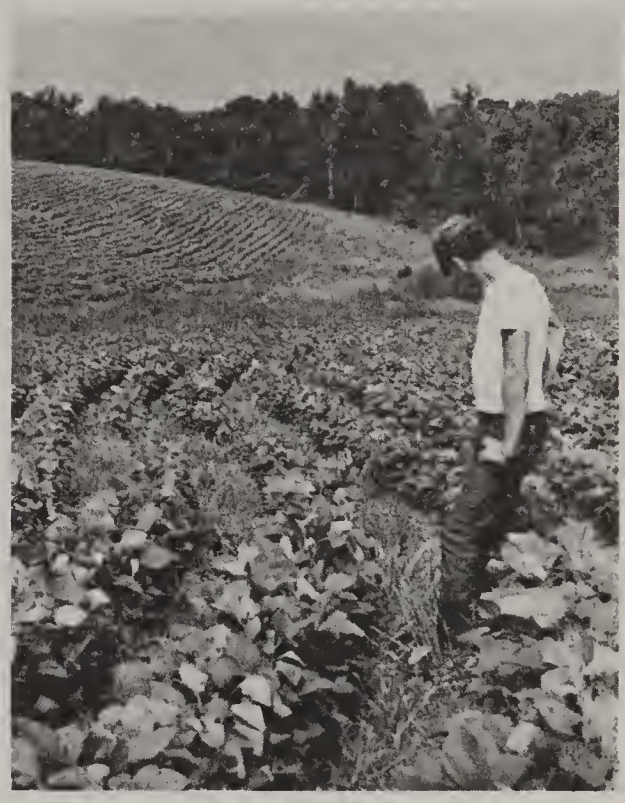
Problems Component Needs Plan Elements	Unit	Extent
I. Soil Erosion and Resulting Sedimentation		
A. Reduction in Sheet and Rill Erosion	million tons/yr.	3.4
1. Adequately treat cropland and pastureland	1,000 ac./yr.	49.0
2. Improve site preparation methods on forest land	1,000 ac./yr.	7.0
B. Reduction in Critical Area Erosion	million tons/yr.	1.8
1. Treat gullies	1,000 ac./yr.	0.2
2. Stabilize roadbanks	1,000 ac./yr.	0.8
3. Stabilize logging roads and skid trails	1,000 ac./yr.	1.0
4. Stabilize construction sites	1,000 ac./yr.	3.0
C. Reduction in Sedimentation Land treatment		1/
II. Loss or Degradation of Resources		
A. Reduction in Loss of Prime and Important Farmland	ac./yr.	500
1. Improve land use planning		basinwide
2. Use tax incentives		basinwide
3. Identify and map prime and important farmland		basinwide
B. Reduction in Loss of Prime Forest Land	ac./yr.	500
1. Improve land use planning		basinwide
2. Use tax incentives		basinwide
3. Identify and map prime forest land		basinwide
C. Protection of Wetlands	ac./yr.	200
1. Protect wetlands during construction activities	sites/yr.	1,800
2. Improve land use planning	sites/yr.	1,800
3. Avoid development in wetlands	sites/yr.	1,800
D. Improvement in Visual Quality	ac./yr.	1,500
1. Improve land use planning	ac./yr.	5,400
2. Treatment of cropland and critical areas	ac./yr.	5,400
3. Improved forest harvesing methods	ac./yr.	1,000
4. Protect visual corridors	ac./yr.	500
E. Protection of Historical and Archeological Sites	number	2/
1. Survey sites before construction	number/yr.	600
2. Protect sites during construction activities	number/yr.	600
3. Preserve or salvage sites	number/yr.	2
III. Future Shortage of Wood Fiber		
Increased Production of Wood Products	million cu.ft./yr.	61.2
1. Planting trees	1,000 ac./yr.	55.0
2. Timber stand improvement	1,000 ac./yr.	5.0
3. Prevention of insects, diseases, wildfires and other losses	million cu.ft./yr.	4.0
4. Salvage of wasted wood	million cu.ft./yr.	13.0
IV. Frequent Yield and Income Loss Due to Drought		
Storage of Irrigation Water		none
V. Frequent Crop Loss Due to Flooding and Wetness		
A. Reduce Floodwater Damages in the Mountains and Piedmont	$million/yr.	0.1
1. Avoid development of flood plains		basinwide
2. Change land to less intensive use	1,000 acres	5.0
3. Treat land for sediment reduction		1/
B. Reduce Wetness Problems in the Coastal Plain	$million/yr.	3.0
1. Avoid development of flood prone areas		basinwide
2. Change land to less intensive use	1,000 acres	48.0
3. On-farm water management systems	1,000 acres	300.0
VI. Floodwater Damages to Nonagricultural Properties		
Reduce Floodwater Damages in Built-up Areas in Communities	number	154
1. Avoid development in flood plain and other flood prone areas		basinwide
2. Change land to less intensive use		basinwide
3. Nonstructural measures - flood insurance, relocation, land acquisition, flood warning systems, flood proofing, dikes and other measures		basinwide
VII. Storage of Community Water Supplies		
Sites for Water Storage		none
VIII. Undeveloped Recreational Resources		
A. Improved Fishing Opportunities		none
B. Improved Hunting Opportunities		none
C. Purchase Additional Land and Develop Recreational Areas		none

1/ Same as reduction in erosion.
2/ Not evaluated in measurable terms.

TABLE 4C-2: EROSION CONTROL MEASURES
ALTERNATIVE C - ENVIRONMENTAL QUALITY

YADKIN-PEE DEE BASIN

Component Need Plan Element Measures	North Carolina Portion Annual Amount (1,000 Acres)	 Annual Cost ($1,000)	South Carolina Portion Annual Amount (1,000 Acres)	 Annual Cost ($1,000)	Total Basin Annual Amount (1,000 Acres)	 Annual Cost ($1,000)
A. Reduction in Sheet and Rill Erosion						
1. Adequately treat cropland and pastureland						
a. System A	1.0	50	0.5	25	1.5	75
b. System B	14.0	420	1.5	45	15.5	465
c. System C	15.0	320	5.0	110	20.0	430
d. System D	3.8	38	0.4	4	4.2	42
e. System E	2.0	40	3.0	60	5.0	100
f. change from crops to pasture	1.0	100			1.0	100
g. pasture planting or replanting	0.7	70	0.2	20	0.9	90
h. pasture improvement	0.7	49	0.2	14	0.9	63
2. Improve site preparation methods on forest land	4.0	340	12.0	1,020	16.0	1,360
B. Reduction in Critical Area Erosion						
1. Treat gullies	0.2	120			0.2	120
2. Stabilize roadbanks	0.6	240	0.2	80	0.8	320
3. Stabilize logging roads and skid trails	0.7	140	0.3	60	1.0	200
4. Stabilize construction sites	2.0	400	1.0	200	3.0	600



Conservation tillage reduces erosion, conserves moisture and cuts production cost.

correct resource management systems.

elements.

2. Improve site preparation methods on forest land

Employment of best management practices as identified in each state's nonpoint source pollution plan will assure a reduction in erosion losses. Treatment will cover 7,000 acres each year where mechanical site preparation and logging road construction occur on steep slopes, near stream channels and on highly erodible soils. (See Table 4C-2 for details.)

B. Reduction in Critical Area Erosion

Reduction in erosion from critically eroding areas is aimed at sediment reduction in streams and lakes, improving the appearance of the landscape and protecting resources.

1. Treat gullies

Gully treatment includes grade control structures, debris basins, overfall pipes and establishment of vegetation. Gullied areas in fields usually require land forming in addition to seedbed preparation and seeding. During the next few years, 200 acres of gullies should be treated each year.

2. Stabilize roadbanks

Stabilization of roadbanks involves sloping banks, preparing seedbeds, fertilizing, seeding and mulching. Follow-up fertilizer is usually needed. An estimated 800 acres of roadbanks should be treated each year.

3. Stabilize logging roads and skid trails

Stabilization of logging roads and skid trails usually requires water bars, brush dams, establishment of vegetation and sometimes diversions. Follow-up treatment is usually needed for special problem areas. One thousand acres should be treated each year.

4. Stabilize construction sites

Stabilization of construction sites usually requires debris basins, seeding and mulching. Protection of sites before erosion occurs is the most important factor in construction site treatment. About 3,000 acres of construction sites should be treated each year.

Grassed waterways control runoff to reduce erosion.

Roadside treatment reduces erosion and improves visual quality.

Resource plans should include the protection and preservation of wetlands, prime farmland, prime forest land, rural landscape - visual quality and archeological and historical sites.

II. Loss or Degradation of Resources

A. Reduction in Loss of Prime and Important Farmland

Prime farmland is prime land for many other uses. The acres of this resource are gradually taken away for other uses.

1. Improve land use planning

All agencies concerned with land use planning assistance should consider prime farmland when making plans for any development. If alternate sites are available, serious consideration should be given to preserving the best land for agricultural production.

2. Use tax incentives

Both states provide property tax incentives for land used for farming. Planners should assist landowners in taking advantage of these incentives in making land use decisions.

3. Identify and map prime farmland

Maps showing locations of prime farmland should be available to all who may influence its preservation or use.

B. Reduction in Loss of Prime Forest Land

In addition to preserving forest land for the production of wood fiber, consideration of open space, pleasant environments and air quality should be an integral part of all resource allocation plans.

1. Improve land use planning

All resource planners should have as one of their goals the preservation of the best of the basin's forest land for forest production.

2. Use tax incentives

Tax incentives available for forest landowners should be used to preserve forest land in its present use.

3. Identify and map prime forest land

Maps should be provided to local government officials and others who influence land use changes.

C. Protection of Wetlands

The highest value wetlands should be preserved from alteration. The highest priority should be the protection of the coastal marshes. Other priorities should include wooded swamps and inland open water and marshes.

1. Protect wetlands during construction activities

Drainage systems should be planned and designed to avoid damage to high value wetlands.

2. Improve land use planning

Plans for protection of wetlands should include legislation, education and commitment.

3. Avoid development of wetlands

Owners of wetlands should be encouraged to avoid filling or other development. Wetlands in some areas might be protected through land use regulations that prohibit development.

D. Improvement in Visual Quality

Visual resources are closely associated with other plan elements such as land treatment, construction methods and tree harvesting.

1. Improve land use planning

Visual resources should be considered when any project or development is designed. Protection of vegetation, layout of channels, placement of buildings and color scheme can impact visual quality.

2. Treatment of cropland and critical areas

Eroded land is one of the blights on visual resources in rural areas, especially on cropland and rural roadsides. Vegetation establishment on roads and construction areas enhances natural beauty. Stripcropping, pond location, orchard layouts and other practices can add to a pleasing landscape.

3. Improve harvesting methods

The timber harvesting method of clear cutting can leave an unpleasant scene. Harvesting methods, especially where strips are left along roads, will help the area appear untouched.

4. Protect visual corridors

Scenic trails and even rural roads can be visual corridors. Planned development and protected resources can make these corridors much more pleasant.

E. Protection of Historic and Archeological Sites

Location of historical and archeological sites is not common knowledge. Hence, when construction is to start, contact should be made with councils of government or appropriate state agencies to make sure no values are destroyed.

1. Survey sites before construction

Sites should be studied for any historical or archeological values before construction is started.

2. Protect sites during construction

If any high values are on or near a construction site, care should be taken to protect these values.

3. Preserve or salvage values

If historical or archeological values are discovered on a construction site, appropriate authorities at state agencies or councils of government should be notified.

III. Future Shortage of Wood Fiber

Increased Production of Wood Products

Efficient management of timber stands assures maximum contributions to environmental quality. Contributions include protection of soil resources, formation of pleasing landscapes, suitable habitat for wildlife species, enhancement of fisheries environment and opportunities for recreation. Under good management, the disturbance by logging operations can be minimized. Changes that occur as a result of timber harvesting are temporary. Regeneration following logging will assure reestablishment of the desired environment.

1. Planting trees

The EQ goal is the reforestation of at least 50 percent of all unstocked or understocked forest land now in Site

Classes 4 and 5[1/]. The area for treatment each year is 55,000 acres, with about one-fourth of the area in North Carolina and three-fourths in South Carolina.

2. Timber stand improvement

The annual goal for timber stand improvement is 5,000 acres. Timber stand improvement should improve timber production as well as the resource for environmental quality.

3. Prevention of insects, diseases, wildfires and other losses

As these hazards are reduced, forest production can improve and environmental quality in the forest will be improved. Each year 4.0 million cubic feet of wood fiber can be saved when these problems are reduced.

4. Salvage of wasted wood

The EQ Alternative calls for the recovery of merchantable volume from rough and rotten trees, logging residue, and trees removed in land clearing but not currently marketed. Forest survey data reports this volume to be about 275 million cubic feet scattered throughout the basin. Forest resource planners estimate a feasible annual recovery rate of 13 million cubic feet.

IV. Frequent Yield and Income Loss Due to Drought

(No plan elements included in the EQ Alternative.)

V. Frequent Crop Loss Due to Flooding and Wetness

A. Reduce Floodwater Damages in the Mountains and Piedmont

Floodwater damages reduce crop yields and agricultural income almost every year. The following measures should help reduce losses.

1. Avoid development of flood plains

Future flood plain development for cropland should be avoided. This may be accomplished through informational programs, planning assistance and incentive programs.

1/ Report 5 (see front cover).

2. Change land to less intensive use

Farmers may change the crops grown in flood plains to more water tolerant species. For example, a change could be made from soybeans to pasture. The EQ Alternative includes 5,000 acres of changed land use.

3. Treat land for sediment reduction

Treatment of eroding land can impact on the amount of sediment delivered to stream channels. A reduction of sediment along with channel restoration can be an effective way to reduce erosion.

B. Reduce Wetness Problems in the Coastal Plain

The primary goal of water management in the Coastal Plain is maintenance of agricultural production with the least environmental cost.

1. Avoid development of flood prone areas

Land subject to severe water problems from flooding and wetness should not be brought into agricultural production. Soils maps and other information can be helpful in determining if land is suitable for crop production.

2. Change to less intensive land use

In areas where losses from flooding or wetness are frequent, land should be removed from crop production and put into some use where damages are lower. The EQ Alternative includes 48,000 acres of cropland that should be planted to grass or trees.

3. On-farm water management systems

The most effective action for managing excess water is on-farm water management systems. These systems include land forming, open ditches, and tile drains. On-farm systems are usually installed by individual landowners with technical and cost-share assistance. The EQ Alternative includes the treatment of 300,000 acres with on-farm systems.

VI. Floodwater Damages to Nonagricultural Properties

Reduce Floodwater Damages in Built-up Areas in Communities

Floodwater damages to properties built in flood plains can be severe. History shows that destructive floods can strike at any time. The following measures should help reduce future flood losses.

1. Avoid development in flood plains and other flood prone areas

   Development in flood plains could be reduced through informational and technical assistance programs. Flood prone maps are available for most communities and could be used to guide development out of flood plains. Land use regulations could be used in some communities.

2. Change land to less intensive use

   Flood damages are reduced in proportion to the damageable values in a flood plain. If buildings in flood plains have outlived their usefulness could be replaced by parking lots or open space, flood damages could be reduced.

3. Nonstructural measures - flood insurance, relocation, land acquisition, flood warning systems, flood proofing, dikes and other measures

   The scope of this study did not include recommendations for controlling flooding in urban areas. Planners have a wide range of nonstructural tools from which to choose the most effective combination for flood damage reduction. Some combination should be effective in each of the 154 communities where flood damages have been identified.

VII. Shortage of Community Water Supplies

(No plan elements included in the EQ Alternative.)

VIII. Undeveloped Recreational Resources

(No plan elements included in the EQ Alternative.)

4D - COMPARISON OF ALTERNATIVES

The primary goal of all alternative courses of action is the improvement of the well-being of the citizens of the basin. Impacts of the alternatives are measured by their ability to meet component needs identified in Alternative A - "Future Without" Condition. For the remainder of this section, Alternative B will be referred to as ED and Alternative C as EQ. Table 4D-1 shows a comparison of the ED and EQ Alternatives for meeting those identified needs.

The EQ Alternative, with 5,000 acres of critically eroding areas treated and 30 percent more cropland treated, would reduce soil losses almost twice as much as the ED Alternative. It is assumed sediment deposited in lakes and ponds and on flood plains would be reduced by a proportionate amount over a long time period.

Protection of resources was included only in the EQ Alternative. The primary methods for meeting these goals would be through improved land use planning, informational programs and integration of these goals in other activities.

The projected demand for wood fiber production would require an immediate acceleration of tree planting and timber stand improvement. Elements of the ED Alternative would be needed to provide wood products required in the future. These goals can be accomplished without environmental degradation.

Irrigation water storage included in the ED Alternative will be needed to insure an adequate supply for future demands. Stream flows can not provide a dependable source of irrigation water and still furnish flows for the many other demands such as water quality, fish, hydro power and municipal and industrial use.

Damages to crops in the Mountains and Piedmont can be reduced by the installation of floodwater retarding dams as included in the ED Alternative. Actions other than floodwater retarding dams in the EQ Alternative would be less effective.

In the Coastal Plain, crop losses from wetness can best be reduced by the installation of the main outlet channels and on-farm water management systems as described in the ED Alternative. The EQ Alternative would provide much less protection from wetness. If farmers make adjustments to more productive and less erosive land such as is found in the Coastal Plain, the end result would be improved net income and decreased erosion for the basin as a whole.

In the urban and built-up areas, the application of nonstructural measures as described in the EQ Alternative would be very effective in reducing floodwater damages. This seems to be the only universal approach that will reach into every community. Floodwater retarding structures included in the ED Alternative will drastically reduce floodwater damages in those areas treated but the vast majority of communities will not be treated by structural means.

Communities in need of water supplies may use information provided by

TABLE 4D-1: COMPARISON OF ALTERNATIVES FOR MEETING COMPONENT NEEDS

YADKIN-PEE DEE BASIN

Problems Component Needs	Alternative A "Future Without" Condition Unit	Need	Alternative B Economic Development Provided	Remaining Need	Alternative C Environmental Quality Provided	Remaining Need
I. Soil Erosion and Resulting Sedimentation						
A. Reduction in Sheet and Rill Erosion	million tons/yr.	16.4	2.8	13.6	3.4	13.0
B. Reduction in Critical Area Erosion	million tons/yr.	5.6	none	5.6	1.8	3.8
C. Reduction in Sedimentation		basinwide	1/		1/	
II. Loss or Degradation of Resources						
A. Reduction in Loss of Prime and Important Farmland	ac./yr.	2,000	none	2,000	500	1,500
B. Reduction in Loss of Prime Forest Land	ac./yr.	3,000	none	3,000	500	2,500
C. Protection of Wetlands	ac./yr.	900	none	900	200	700
D. Improvement in Visual Quality	ac./yr.	2,000	none	2,000	1,500	500
E. Protection of Historical and Archeological Sites	number	1/	none	1/	1/	
III. Future Shortage of Wood Fiber Increased Production of Wood Products	million cu.ft./yr.	64.3	64.3	0	61.2	3.1
IV. Frequent Yield and Income Loss Due to Drought Storage of Irrigation Water	1,000 ac.ft.	20.0	20.0	0	none	20.0
V. Frequent Crop Loss Due to Frequent Flooding and Wetness						
A. Reduce Floodwater Damages in the Mountains and Piedmont	$million/yr.	4.7	1.2	3.5	0.1	4.6
B. Reduce Wetness Problem in the Coastal Plain	$million/yr.	22.6	5.9	16.7	3.0	19.6
VI. Floodwater Damage to Non-Agricultural Properties Reduce Floodwater Damages in Built-up Areas in Communities	number	154	154	0	154	0
VII. Storage of Community Water Supplies Sites for Water Storage	number	2/	2/		2/	
VIII. Undeveloped Recreational Resources						
A. Improved Fishing Opportunities	1,000 visitor days/yr.	115	115	0	none	115
B. Improved Hunting Opportunities	1,000 visitor days/yr.	82	82	0	none	82
C. Purchase Additional Land and Develop Recreational Areas	1,000 acres	14.0	14.0	0	none	14.0

Not estimated.
See the U.S. Water Resources Council "Level B" Study.

the potential dam site study made earlier[1/]. The U.S. Water Resources Council, "Level B" Study for the Yadkin-Pee Dee Basin projected future needs for water supply.

All of the improvements in recreational development were placed in the ED Alternative even though EQ benefits would occur. An estimated 197,000 days of recreational opportunities would accrue to improvements in hunting and fishing opportunities. An additional 100,000 recreation days would be provided by the recreational developments.

Three accounts, Economic Development, Environmental Quality and Other Social Effects, are used to compare the impacts of the two alternative plans. Tables 4D-2 through 4D-7 are the displays of the three account systems.

1/ Report 7 (see front cover).

TABLE 4D-2: ECONOMIC DEVELOPMENT ALTERNATIVE

ECONOMIC DEVELOPMENT ACCOUNT

Beneficial Effects	(Average Annual $1,000) 1/	Adverse Effects	(Average Annual $1,000) 2/
A. Value of increased output of goods and services		Value of resources required for the ED Alternative	
1. Flood damage reduction	1,174	1. Multiple purpose reservoirs, floodwater retarding structures, recreational developments and channel work in projects	
2. Reduced wetness	5,910	project installation	1,876
3. Irrigation water supply	280	OM&R	207
4. Increased recreation	640	2. Recreational development	212
5. Increased timber production	11,181	3. Increased timber production	9,200
6. Utilization of labor resources for project construction	513	4. On-farm water management	2,280
B. External economies		5. Project administration	85
Indirect activities associated with increased net returns from flood damage reduction, drainage and increased timber production	855	6. Irrigation reservoirs	240
		Total Adverse Effects	14,100
Total Beneficial Effects	20,553	Net Beneficial Effects	6,453

1/ Current normalized prices for crop and pasture; 1979 prices for other.
2/ Evaluated at 7 3/8 percent interest; drainage 50 years; all other 100 years.

TABLE 4D-3: ECONOMIC DEVELOPMENT ALTERNATIVE

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Effects
Beneficial and Adverse Effects	
A. Areas of natural beauty	1. Maintenance of maximum forest cover by dispersing harvest areas.
	2. Reforestation of 65,000 acres.
	3. Reduce erosion on 42,900 acres each year as a result of land treatment.
	4. Reduce sediment delivery into lakes and streams.
	5. Create 2,000 acres of lakes and ponds.
	6. Installation of 264 miles of main outlet channels will change the natural vegetation along rights-of-way.
B. Quality consideration of air, land and water resources	1. Erosion control practices on 42,900 acres of eroding land each year will improve land and water quality.
	2. Flood prevention measures will decrease flooding damages on 11,500 acres and wetness problems on 480,000 acres.
	3. Buffer strips of forest cover left along streams will reduce degradation of stream ecosystem.
	4. Creation of 603 lakes will inundate 2,000 acres of land.
	5. Windbreaks, hedgerows and other practices will reduce wind erosion on unprotected areas which would otherwise degrade air quality at certain times.
	6. Assistance to loggers and timber buyers will result in better utilization of 17 million cubic feet of timber and woods waste annually.
	7. Channel construction can degrade water quality for a short duration during construction.
	8. Reduce acres required to be cleared for crop production.
C. Biological resources and selected ecosystems	1. Improved fish pond management on 1,000 ponds and construction and stocking of 603 ponds and lakes.
	2. Reduction of sediment will improve and protect fishery habitat.
	3. 264 miles of channel will have varying effects on fish and wildlife.
	4. Field border plantings, hedgerow plantings, channel rights-of-way plantings and cropland multiple use will benefit numerous wildlife species by providing food and cover and increase edge habitat.
	5. Reforestation of 65,000 acres of forest land annually can increase wildlife habitat for certain species.
	6. Maintaining hardwood stands to provide mast will help preserve habitat variability.
D. Archeological and historical	No archeological or historical sites have been identified in the areas where work is planned. More detailed studies and plans for preservation will be made before construction is started.
E. Irreversible or irretrievable commitments	1. Creation of 603 lakes will inundate 2,000 acres of land.
	2. Channel work will result in clearing 700 acres of woods that will be replanted to grass and trees.

TABLE 4D-4: ECONOMIC DEVELOPMENT ALTERNATIVE

OTHER SOCIAL EFFECTS ACCOUNT

Components	Measures of Effects	Components	Measures of Effects
Beneficial and Adverse Effects		Beneficial and Adverse Effects	
A. Income Distribution	Creates 944 fulltime jobs and 20 part-time jobs. Creates 250 man-years of employment for construction.	C. Recreational Opportunities	Provides 180,000 visitor-days of recreational opportunities.
B. Life, Health and Safety	Reduces insect breeding areas by removal of water in built-up areas.		

TABLE 4D-5: ENVIRONMENTAL QUALITY ALTERNATIVE

ECONOMIC DEVELOPMENT ACCOUNT

Beneficial Effects	(Average Annual $1,000) 1/	Adverse Effects	(Average Annual $1,000) 2/
A. Value of increased output of goods and services		Value of resources required for the EQ Alternative	
1. Flood damage reduction	110	1. Nonstructural urban flood reduction	69
2. Reduced wetness	3,010	2. Increased timber production	5,605
3. Increased timber production	6,800	3. On-farm water management	2,310
B. External economies		Total Adverse Effects	7,984
Indirect activities associated with increased net returns from flood damage reduction, drainage and increased timber production	98		
Total Beneficial Effects	10,018	Net Beneficial Effects	2,034

1/ Current normalized prices for crop and pasture; 1979 prices for other.
2/ Evaluated at 7 3/8 percent interest; drainage 50 years; all other 100 years.

TABLE 4D-6: ENVIRONMENTAL QUALITY ALTERNATIVE

ENVIRONMENTAL QUALITY ACCOUNT

Components	Measures of Effects	Components	Measures of Effects
Beneficial and Adverse Effects		Beneficial and Adverse Effects	
A. Areas of natural beauty	1. Maintenance of maximum forest cover on 80,000 acres by dispersing harvest areas.	C. Biological resources and selected ecosystems	1. Reduction of sediment will improve and protect fishery habitat.
	2. Reforestation of 55,000 acres annually.		2. Field border plantings, hedgerow plantings, channel rights-of-way plantings and cropland multiple use will benefit numerous wildlife species by providing food and cover and increase edge habitat.
	3. Restriction of tree harvests to protect 2,000 acres of visual corridors and buffer strips each year.		3. Reforestation of 55,000 acres of forest land annually can increase wildlife habitat for certain species.
	4. Reduce erosion on 61,000 acres each year as a result of land treatment.		4. Maintaining hardwood stands to provide mast will increase habitat variability.
	5. Reduce sediment delivery into lakes and streams.	D. Archeological and historical	No archeological or historical sites have been identified in the areas where work is planned. More detailed studies and plans for preservation will be made before construction is started.
B. Quality consideration of air, land and water resources	1. Erosion control practices on 61,000 acres each year will improve land and water quality.		
	2. Buffer strips of forest cover left along streams will reduce degradation of stream ecosystem.		
	3. Nonstructural measures can reduce damages caused by flooding in 154 communities.		
	4. Windbreaks, hedgerows and other practices will reduce wind erosion on unprotected areas which would otherwise degrade air quality at certain times.		
	5. Assistance to loggers and timber buyers will result in better utilization of 13 million cubic feet of timber and woods waste annually.		

TABLE 4D-7: ENVIRONMENTAL QUALITY ALTERNATIVE

OTHER SOCIAL EFFECTS ACCOUNT

Components	Measures of Effects	Components	Measures of Effects
Beneficial and Adverse Effects		Beneficial and Adverse Effects	
A. Income Distribution	Creates 80 fulltime jobs.	C. Recreational Opportunities	Improve recreational opportunities.
B. Life, Health and Safety	1. Provides flood damage reduction to residents in 154 rural communities.		
	2. Reduces insect breeding areas by removal of water in built-up areas.		

4E - RECOMMENDED ALTERNATIVE BY STUDY TEAM

This section describes the alternative recommended by the river basin study team. Costs of each plan element are described in Alternative B or C. USDA costs are summarized in Table 3-1.

I. Soil Erosion and Resulting Sedimentation

The plan elements listed under Alternative C - Environmental Quality are recommended for early action implementation.

A. Reduction in Sheet and Rill Erosion

1. Adequately treat cropland and pastureland

Acceleration to adequately treat 49,000 acres annually will require additional inputs from government and individuals. Accelerated technical assistance could be provided through the districts by the SCS conservation operations programs for soil surveys, planning and application. Federal funds usually provide about 80 percent of the technical assistance. State and local funds provide the remaining 20 percent. Technical assistance provided by PL-46 funds should be accelerated by $240,000 per year for the next 10 years. Soil surveys should be accelerated so that completion dates for all counties could be within six years, rather than 10 years under the going rate. Matching funds from state and local governments should be added to the federal effort.

Cost-sharing for application of treatment systems could be through the ACP, PL-566 or RC&D programs. ACP should be accelerated by $320,000 per year for 10 years. PL-566 should provide $170,000 per year and RC&D $35,000 for 10 years. Other funds would provide $600,000. FmHA loans could help pay this cost.

2. Improve site preparation methods on forest land

An annual acceleration for improving site preparation on 7,000 acres will cost $1,360,000. Acceleration needed to meet this goal will include technical assistance and cost-sharing for application under several programs as follows: PL-46 - $10,000; PL-566 - $20,000; RC&D - $5,000; ACP - $155,000; CFM - $170,000 and FIP - $200,000. More than half of acceleration would come from nonUSDA sources.

B. Reduction in Critical Area Erosion

1. Treat gullies

Gully treatment will require additional funds from almost all available programs. Funds are needed annually for 10 years as follows: PL-46 - $10,000; PL-566 - $30,000; RC&D - $5,000; ACP - $15,000 and CFM - $10,000. About $50,000 would be needed from other funds.

2. Stabilize roadbanks

Roadbank treatment takes special coordination since roads are the responsibility of state or county governments. Federal funds may be used to provide materials for this work. Acceleration needs are as follows: PL-46 - $20,000; PL-566 - $120,000 and RC&D - $10,000. About half of the needed funds would come from other funds.

3. Stabilize logging roads and skid trails

Stabilization of areas in forests should be done as other work is carried out. An additional $60,000 from PL-566, ACP and CFM would be needed. Other funds would provide $140,000.

4. Stabilize construction sites

Construction sites should be stabilized by the construction company. Accelerated funds are needed for technical assistance in planning and applying practices. An estimated $70,000 from PL-46 and RC&D could satisfy this need.

C. Reduction in Sedimentation

As erosion control systems are installed, sediment will be reduced. No additional acceleration is planned.

II. Loss or Degradation of Resources

Elements from Alternative C - Environmental Quality are recommended for acceleration.

A. Reduction in Loss of Prime and Important Farmland

All of the plan elements under this component need require accelerated technical assistance for providing on-site information to land users and land use planners. The primary source of this information is the PL-46 program where $23,000 is needed each year. PL-566 and RC&D could provide

$4,000 to furnish information on project areas. Other funds would finance the bulk of this work.

B. Reduction in Loss of Prime Forest Land

All of the plan elements under this component need require accelerated technical assistance. The primary source of funds for this work is the CFM Program. The PL-46 program could help. About $9,000 in accelerated USDA funds is needed. Other funds would provide about $14,000.

C. Protection of Wetlands

All of the plan elements associated with wetland protection require accelerated technical assistance. The primary mission would be providing on-site information to landowners and potential developers. USDA funds through PL-46, PL-56, RC&D and CFM totaling $23,000 could promote this work. Funds from other sources would be greater than those provided by USDA since all federal and state agencies have as their objectives the protection of high value wetlands. The Water Bank Program could be used to cost-share in wetlands protection.

D. Improvement in Visual Quality

All elements under this component need would benefit from acceleration of technical assistance from USDA. Many of these elements should be carried out as a part of any planning and installation program. PL-46, PL-566 and CFM could provide $14,000 each year for making sure visual resources are considered.

E. Protection of Historical and Archeological Sites

Plan elements for this component need require technical assistance. An information program is important. About $9,000 is needed for acceleration of this work. State agencies usually provide leadership for investigations.

III. Future Shortage of Wood Fiber

Increased Production of Wood Fiber

The plan elements under Alternative B - Economic Development are recommended for inclusion for basin development. The state foresters of both North Carolina and South Carolina have cooperative agreements with the Secretary of Agriculture to participate in all program activities authorized under the Cooperative Forestry Assistance Act of 1978. In addition, each state has one or more programs authorized under their respective

legislatures that complement progams funded under the Cooperative Forestry Assistance Act. In North Carolina, the North Carolina Forest Development Program has been implemented to encourage reforestation of harvested forest lands, idle lands and underproductive forest lands. The Landowner Assistance Program (LAP) is designed by the South Carolina Commission of Forestry to provide special reforestation equipment, on a rental basis, to forest landowners or contractors for site preparation and tree planting. These programs are funded with state appropriations.

Reforestation activities involve a number of separate steps under an accelerated effort. Encouraging landowners to undertake reforestation projects is a responsibility of the Extension Service. It is essential that the informational phase of this program be coordinated with the state forestry agencies who must produce and distribute forest tree seedlings. Field workers in each of the state forestry agencies routinely encourage landowners to regenerate their idle land or non-productive forest land.

Utilization of unused wood fiber requires the encouragement of loggers, forest landowners and other wood processors. Again, Extension Service has a significant role to play in enlisting the participation of all parties in the recovery of wood waste. Field staffs of the state forestry agencies contribute to this program in their recommendations to forest landowners who request assistance in the management of their timber lands.

Timber stand improvement (TSI) practices are also covered in recommendations made to forestry landowners by service foresters and forestry technicians. Efforts to encourage forest landowners to carry out TSI work can be supplemented by field staff of the Extension Service. Demonstrations and general informational programs are other activities that can be used to encourage cooperation.

1. Planting trees

   Tree planting is the single most costly plan element. Accelerated funds for technical assistance are needed as follows: PL-46 - $20,000; PL-566 - $10,000; RC&D - $2,000 and CFM - $168,000. For cost-sharing in tree planting, $188,000 is needed from ACP and $1,200,000 from FIP. Other funds would need to provide $900,000 each year.

2. Timber stand improvement

Timber stand improvement would require accelerated funds annually from USDA programs as follows: PL-46 - $20,000; PL-566 - $10,000; RC&D - $2,000; ACP - $40,000; CFM - $220,000 and FIP - $300,000. Other funds would provide $600,000.

3. Prevention of insects, diseases, wildfires and other losses

Prevention of losses involves a wide range of activities from control to salvage. Programs could be accelerated to help provide for this work. Under USDA, the CFM program would provide the bulk of needed funds. State funds would also need to be accelerated.

4. Salvage of wasted wood

Technical assistance could help to get this job done. As the demand for additional wood fiber increases, the need for salvage of this resource becomes more important.

IV. Frequent Yield and Income Loss Due to Drought

The plan element under Alternative B - Economic Development is recommended for adoption.

Storage of Irrigation Water

Construction of reservoirs

Technical assistance and cost-sharing for construction are needed to install this plan element. ACP funds need to be accelerated by $200,000 per year for cost-sharing in reservoir construction. Technical assistance under PL-46 needs to be accelerated by $60,000. Funds other than USDA would be required. Construction costs other than ACP would be paid by individuals with FmHA or other loans. The states or the U.S. Geological Survey could provide technical assistance for ground water development.

TABLE 4E-1: POSSIBLE DAMS IN PL-566 WATERSHED PROJECTS

YADKIN-PEE DEE BASIN (NORTH CAROLINA PORTION)

Subbasin Mini-basin (Number and Name) Counties	Dams	Purpose Served and Cost Flood Control PL-566	 Other	Recreation PL-566	 Other
	(No.)	($1,000)			
Upper Yadkin River					
110 Ararat River					
Surry and Yadkin	4	2,830	1,170		
140 Forbush-Logan Creeks					
Yadkin	2	850	350		
Lower Yadkin River					
010 Tri Creeks					
Rown	4	2,822	1,178		
Rocky River					
028 Coddle-Coldwater, Dutch Buffalo Creeks					
Carrabus, Rowan and Iredell	13	3,372	1,538	1,191	972
TOTAL		9,874	4,236	1,191	972

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

UPPER YADKIN

SOUTH YADKIN

LOWER YADKIN

ROCKY

LYNCHES

BLACK

UPPER PEE DEE

LUMBER

LITTLE PEE DEE

LOWER PEE DEE

WACCAMAW

COASTAL

LEGEND

ACCOUNTING UNIT BOUNDARY

SUB-BASIN BOUNDARY

MINI BASIN BOUNDARY

AREAS WITH POTENTIAL FOR PROJECT ACTION

VICINITY MAP

Figure 4 F - 1

POTENTIAL PROJECT ACTION MAP

Yadkin-Pee Dee River Basin

NORTH CAROLINA, SOUTH CAROLINA AND VIRGINIA

0 10 20 30 40

APPROXIMATE SCALE MILES

COMPILED FROM USGS 1:500,000 STATE BASE MAPS.
LAMBERT CONFORMAL CONIC PROJECTION.
GRID TICKS BASED ON NORTH CAROLINA
COORDINATE SYSTEM AND SOUTH CAROLINA
COORDINATE SYSTEM, NORTH ZONE.

June 1980

June 1980 4-R-37466

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USDA—SCS—FORT WORTH TEXAS 1980

V. Frequent Crop Loss Due to Flooding and Wetness

Plan elements included in Alternative B - Economic Development are recommended for acceleration.

A. Reduce Floodwater Damages in the Mountains and Piedmont

1. Change land to less intensive use

Technical assistance providing information to farmers in alternative crops could be accelerated through the PL-46, PL-566 and RC&D programs. About $6,000 is needed each year for technical assistance. Individual landowners would bear most of the cost estimated to be $40,000 per year.

2. Floodwater retarding dams

The primary program providing funds for floodwater retarding dams is PL-566. Funds through this program would not be used in a steady flow due to the cost of individual structures, but on the average about $294,000 per year would be required over a 20 year period to install floodwater retarding dams. Land rights and other costs would amount to about $112,000 per year and would be provided by sources other than PL-566. Table 4E-1 and Figure 4E-1 show the possible PL-566 projects in the basin.

3. Channel restoration

Channel restoration when selected as the proper course of action would require technical assistance including engineering and geology information. The PL-46 and RC&D programs could provide this assistance which is estimated at $5,000 per year. Other funds would be used to pay construction costs.

B. Reduce Wetness Problems in the Coastal Plain

1. Change land to less intensive use

Technical assistance providing farmers with information about soils and water tolerant crops could help in making decisions on land use. The PL-46 program could be accelerated to provide this assistance with an annual cost of $4,000. Most of the cost of conversion would be paid by individual landowners. These costs are estimated to be $50,000 per year.

TABLE 4E-2: POTENTIAL MAIN CHANNEL PROJECTS

YADKIN-PEE DEE BASIN

Subbasin Mini-basin (Number and Name) County(ies)	Channel (Miles)	Cost PL-566 or RC&D ($1,000)	Other ($1,000)	Total ($1,000)
Lower Pee Dee				
150 Smith Swamp Marion	9	145	97	242
Lynches				
110 Carter Creek Florence, Sumter	8	130	85	215
130 Big Swamp Florence	6	97	64	161
140 Salem Community Florence, Williamsburg	5	80	54	134
Lumber				
030 North West Pembroke Robeson	5	82	55	137
050 Upper Bear Swamp Canal Robeson	17	264	176	440
050 Moss Neck Robeson	19	570	380	950
060 Raft Swamp Robeson	17	280	188	468
130 Ten Mile Swamp Robeson	9	128	85	213
180 Ashpole Swamp Robeson	13	197	131	328
Little Pee Dee				
040 Buck Swamp-Reedy Creek Dillon, Marion, Marlboro	12	194	129	323
060 Cartwheel Community Horry	10	161	108	269
070 Lake Swamp Horry	15	242	161	403
080 White Oak Creek, Back Swamp, Reedy Creek Marion	7	113	75	188
Black				
030 Upper Black River Lee	15	242	161	403
070 Kingstree Canal Clarendon, Florence, Williamsburg	20	323	215	538
080 Pudding Swamp Lee, Sumter, Clarendon	14	226	150	376
090 Stoney Run Williamsburg	5	81	54	135
098 Ox Swamp Williamsburg	3	52	34	86
110 Black Mingo Williamsburg	7	143	95	238
Waccamaw				
010 Brown Marsh Bladen	22	323	216	539
010 White Marsh Columbus	8	122	80	202
020 North Lake Waccamaw Columbus	3	50	32	82
120 White Oak Swamp Horry	11	178	118	296
140 Brown-Grier Swamp Horry	8	130	85	215
BASIN TOTAL	268	4,653	2,686	7,339

2. On-farm water management systems

On-farm water management systems are an important part of the ED Alternative. Technical assistance can be provided through the PL-46 program for planning and engineering assistance. The present ACP program would need to be changed to provide an estimated $360,000 per year for construction cost-sharing for on-farm water management systems. In addition to federal cost-sharing, the costs to landowners would be about $423,000 per year for 20 years.

3. Construct main channels

Main channels are necessary where no outlets for on-farm systems are available. PL-566 is the primary program that could be used to help install main channels. The RC&D program can help in designated areas. An estimated $132,000 each year from PL-566 funds and $18,000 each year from RC&D funds would be needed for the next 20 years to install main channel projects. About $87,000 would be paid by local groups. Table 4E-2 and Figure 4E-1 show the possible main channel projects.

VI. Floodwater Damages to Nonagricultural Properties

Plan elements from both Alternative B and Alternative C are recommended for reducing floodwater damages in urban and built-up areas.

Reduce Floodwater Damages in Built-up Areas

1. Avoid development in flood plains

Technical assistance could be provided through the PL-46 program to developers and others. Information on flood prone areas and frequency of flooding might be provided. The primary responsibility for this plan element falls on local governments who must control flood plain development.

2. Change land to less intensive use

Technical information as to flood prone areas and flood damages could be provided by USDA, but the main responsibility for urban areas falls on the local governments.

3. Nonstructural measures

Nonstructural measures such as flood insurance, relocation, land acquisition, flood warning systems, flood proofing, dikes and other elements are the most practical approaches to reducing flooding in a majority of the problem areas in the basin. USDA through the PL-46 program can help provide

information and limited technical assistance in establishing these measures. Under PL-566, flood plain studies may be made to provide information to communities and to prospective developers or homeowners.

4. Floodwater retarding dams

Floodwater retarding dams may be used in selected areas to control flooding in urban areas. Table 4E-1 and Figure 4E-1 show the proposed PL-566 projects where dams might be constructed. An estimated $200,000 per year from PL-566 would be needed for construction and engineering for building flood control dams for urban areas. About $100,000 would be needed from other funds to provide land rights and other local costs.

5. Construct main channels

Main channels are needed in some Coastal Plain communities to provide outlets for street collector systems and storm drains. The PL-566 and RC&D programs could be used to help construct these channels. An estimated $60,000 of PL-566 and $10,000 of RC&D funds would be needed to provide construction grants to Coastal Plain communities. Other funds would need to provide about $60,000 for part of the construction costs and land rights costs.

6. Restore channels by removing debris and sediment

Technical assistance may be provided to communities who plan to restore channels by removing debris and sediment. This assistance would be in the form of channel capacities and soil stability information.

VII. Shortage of Community Water Supplies

Sites for Water Storage

Construct reservoirs

USDA programs are limited in providing assistance for community water supplies. The PL-566 program can be used to construct multiple purpose structures where flood control and other purposes may be provided in addition to community water supplies. No cost estimates were made for this measure, but potential sites have been analyzed to provide information to communities who wish to construct reservoirs. The U.S. Army Corps of Engineers and the Department of Housing and Urban Development may assist communities with planning water supply development.

VIII. Undeveloped Recreational Resources

The plan elements listed in Alternative B - Economic Development are recommended for implementation.

A. Improved Fishing Opportunities

1. Improve farm pond management

Pond management would be done by individual owners with technical assistance from state or federal agencies. The PL-46 and RC&D programs can provide some of this assistance. Most of the cost will be borne by other funds.

2. Develop stream access points

Stream access points or boat ramps could be developed near road crossings with state or local support. In qualified areas, RC&D funds may be used to help bear the cost. Technical assistance could be provided by the PL-46 program.

B. Improved Hunting Opportunities

1. Improved upland habitat

Upland habitat improvement on 16,500 acres per year would be carried out by individual landowners with technical assistance through the PL-46 and RC&D programs. The technical assistance costs are estimated at $20,000 and other costs $590,000.

2. Improved wetland habitat

Bottom land habitat improvement would be carried out by individual landowners or groups. Technical assistance could be provided through the PL-46 program or the RC&D program. An estimated $4,000 per year would be needed for technical assistance. Other costs are estimated to be $181,000 annually.

C. Purchase Additional Land and Develop Recreational Areas

1. Acquire land for Class I and II parks

Park development is an activity carried on by state and local governments with some financial support from federal funds. USDA programs are limited but under certain conditions, such as multiple purpose project under PL-566

or a special measure under RC&D, funds could be available. The most likely source of funds for land acquisition is the National Park Service.

2. Develop water based recreational areas

Again, recreation is a function of state and local governments. Under certain conditions, the PL-566 and RC&D programs can assist in land acquisition, engineering and construction of recreation sites. Three sites in the Coddle, Coldwater, Dutch Buffalo Watershed project could be cost-shared from PL-566 funds. Others may be treated the same as needs are refined and projects are developed. The National Park Service is the most likely source of funds to states for recreational development.

APPENDIX 1
COST MINIMIZATION PLANNING MODELS AND DESCRIPTIONS OF SPGs SUBJECTED TO LAND TREATMENTS

To aid in developing projections of land use and levels of production for major crops to the year 2000, individual linear programming planning models for North and South Carolina were developed. Enterprise budgets were prepared for crops grown on specified soil productivity groups (SPGs). Acreages for each SPG, costs and net returns for each enterprise and projected ranges of crop acreage and production levels were incorporated into the models. There were no constraints on availability of capital and labor. Conversion of forest land to cropland was also included. The models were developed to determine land uses and production levels consistent with realizing projected production for major crops at state levels to year 2000 while using available land in a least-cost manner. Following review by the USDA Planning Staff, these results represent the "base" condition, also known as the "future without" condition. Costs and returns were based on "normalized" prices[1/].

Projections of production requirements to year 2000 were comparable to the OBERS E' projections for North Carolina[2/]. Similar projections for South Carolina were adjusted because of high requrements for converting forest land to cropland to realize OBERS projections and recent changes in production trends, as identified by the USDA Planning Staff. Since the projections of production for each state were consistent with those for other states so to sum to national levels, the planning models were formulated so as to examine how projected production for each state could be met at minimum production cost.

In addition to the projected "base" acreage and production in 2000[3/], land treatment programs representing improved drainage and removal of cropland from production where soil erosion was excessive were analyzed. These treatments were applied to specific SPGs within and outside the Yadkin and Pee Dee portions of the basin in North and South Carolina, respectively. Changes in projected acreage and production between the "base" levels and those associated with the land treatment projects were estimated (Tables 2-1 and 2-2). Results for the state models were disaggregated into reaches--subareas of the state--based on ranges of historical shares of production among respective reaches. The Yadkin and Pee Dee portions are represented

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1/ Normalized prices are weighted averages of actual season prices over a five year period to adjust for short-term price fluctuations. For a discussion of the procedure, see Niehaus, Robert D. "'Normalized' Prices for Project Evaluation", Agricultural Economics Research, Vol. 28, No. 2, Economic Research Service, USDA, Washington, D.C. April 1976.

2/ The OBERS projectsions are a set of nationally consistent agricultural projections for individual states prepared by the U.S. Department of Commerce and the USDA for the U.S. Water Resources Council. These projections reflect recently high levels of U.S. agricultural exports.

3/ Report 1 (see front cover).

by Reach 4 in North Carolina and Reach 3 in South Carolina (Figure 2-1). These reaches approximate the hydrologic boundaries of the two subbasins within the Yadkin-Pee Dee Basin.

Description of SPGs Subjected
to Improved Drainage and Erosion Control Programs

North Carolina 1/

Soil Productivity Group 1

This SPG contains productive intermountain plateau and valley soils on slopes of 2 to 25 percent, generally deep and well drained, having a loamy surface layer and moderate permeability. Slope and surface runoff are the main management problems. The land capability classes and subclasses are IIe, IIIe and IVe. Important soils are:

Braddock
Brevard
Brookshire
Citico
Dyke
Haywood
Spivey
Tate
Thurmont
Tusquitee

Soil Productivity Group 2

This SPG contains productive intermountain plateau and valley soils on slopes of 2 to 25 percent, moderately deep and well drained, having a loamy surface texture and moderate permeability. Slope and surface runoff are the main management problems. The land capability classes and subclasses are IIe, IIIe and IVe. Important soils are:

Chester
Clifton
Fannin
Hayesville
Rabun

Soil Productivity Group 11

This SPG contains moderately productive Piedmont soils on highly dissected landscapes, slopes of 6 to 15 percent, moderately deep, well drained, having a sandy loam surface texture and moderate permeability. Slope and surface runoff are the main management problems. The land capability classes and subclasses are IIIe and IVe. Important soils are:

Cecil
Georgeville
Herndon
Hiwassee
Lockhart
Nason
Pacolet
Tatus
Wedowee

1/ USDA. Soil Productivity Groups--North Carolina. Supplemental Economic Base Information. August 1974.

Soil Productivity Group 12

This SPG contains moderately productive Piedmont soils that are plastic and on broad slopes of 2 to 15 percent, moderately deep, moderately well and well drained, having a loamy surface texture and slow permeability. Slope, surface runoff and permeability are the main management problems. The land capability classes and subclasses are IIe, IIIe and IVe. Important soils are:

Colfax
Creedmoor
Enon
Helena
Iredell
Lignum
Mecklenburg
Orange
Vance
White Store

Soil Productivity Group 16

This SPG is made up of moderately productive Piedmont soils on highly dissected landscapes on slopes of 15 to 25 percent, deep, well drained, having a clay loam surface texture and moderate permeability. Slope and surface runoff are the main management problems. The land capability classes and subclasses are VIe and VIIe. Important soils are:

Alamance
Appling
Cecil
Davidson
Durham
Georgeville
Granville
Grover
Hiwassee
Lockhart
Madison
Mayodan
Nason
Pacolet
Tatum
Wedowee

Soil Productivity Group 23

This SPG is made up of moderately productive Coastal Plain and stream terrace soils on slopes of 0 to 2 percent, deep, moderately well and somewhat poorly drained, having a fine sandy loam surface texture and moderately slow permeability. Wetness is the main management problem. The land capability class and subclass is IIw. Important soils are:

- Altavista
- Augusta
- Barclay
- Bertie
- Craven
- Dogue
- Dunbar
- Duplin
- Exum
- Johns
- Goldsboro
- Lenoir
- Lynchburg
- Nahunta
- Onslow
- Wahee
- Wrightsboro

Soil Productivity Group 24

This SPG is made up of low producing first bottom soils along Coastal Plain streams that frequently flood, slopes of 0 to 2 percent, deep, poorly drained and having a loamy surface texture and moderate permeability. Flooding and wetness are the main management problems. The land capability class and subclass is IVw. Important soils are:

- Bibb
- Chastain
- Johnston
- Roanoke
- Wehadkee

Soil Productivity Group 26

This SPG is made up of moderately productive, level Coastal Plain and stream terrace soils on slopes of 0 to 2 percent, deep, poorly drained and having a loamy surface texture and moderate to slow permeability. Wetness if the main management problem. The land capability class and subclass is IIIw. Important soils are:

- Bladen
- Coxville
- Grifton
- Leaf
- Liddell
- Lumbee
- McColl
- Meggett
- Myatt
- Pasquotank
- Rains
- Trebloc
- Weston
- Woodington

South Carolina 1/

Soil Productivity Group 12

This SPG is made up of productive Coastal Plain soils on slopes less than 2 percent which are moderately well and somewhat poorly drained. The land capability class and subclass is IIw. Important soils are:

Dunbar	Rains
Lynchburg	Craven

Soil Productivity Group 13

This SPG is made up of productive well drained Coastal Plain soils which are sloping. The major soil problem is erosion. The land capability class and subclass is IIe. Soils in this group are:

Norfolk	Gilead

Soil Productivity Group 14

This SPG is made up of productive Coastal Plain soils on steeper slopes whose major soil peroblem is erosion. The land capability class and subclass is IVe. Major soils are:

Faceville	Marlboro
Gilead	Wilkes

Soil Productivity Group 16

This SPG is made up of fairly productive, poorly drained Coastal Plain soils whose major problem is wetness. The land capability class and subclass is IIIw. Major soils are:

Bladen	Portsmouth
Coxville	Rains

Soil Productivity Group 18

This SPG is made up of fairly productive, poorly drained Coastal Plain soils whose major problem is excess water. The land capability classes and subclasses are IIIw and IVw. Major soils are:

Grady	Portsmouth
Ponzer	Rutlege

1/ Unpublished worksheet prepared as a part of this study.

Soil Productivity Group 19

This SPG is made up of excessively drained Coastal Plain sands whose major problem is droughtiness . The land capability class and subclass is IVs. Major soils are:

Chipley	Wagram
Lakeland	

Soil Productivity Group 23

This SPG is made up of sloping Piedmont soils whose major problem is erosion. The land capability class and subclass is IIIe. Major soils are:

Enon	Mayodam
Madison	Pacolet

Soil Productivity Group 24

This SPG is made up of excessively sloping Piedmont soils whose major problem is erosion. The land capability class and subclass is IVe. Soils are:

Enon	Pacolet
Madison	Wilkes

Soil Productivity Group 35

This SPG is made up of fairly productive sloping to excessively sloping soils in the Sand Hills whose major problem is erosion. The land capability class and subclass is IVe. Major soils are:

Gilead	Tatum
Madison	Wilkes

Soil Productivity Group 40

This SPG is made up of excessively drained soils in the Sand Hills. The land capability class and subclass is IVs. Major soils are:

Lakeland	Wagram
Troup	

Soil Productivity Group 44

This SPG is made up of productive, somewhat poorly drained, nearly level soils in the Atlantic Coast Flatwoods. The land capability class and subclass is IIw. Major soils are:

Craven	Duplin
Dunbar	Goldsboro

Soil Productivity Group 48

This SPG is made up of poorly drained soils in the Atlantic Coast Flatwoods. The land capability class and subclass is IIIw. Major soils are:

Bladen	Portsmouth
Coxville	Rains

Soil Productivity Group 50

This SPG is made up of very poorly drained soils in the Atlantic Coast Flatwoods. The land capability class and subclass is IIIw. Major soils are:

Coxville	Portsmouth
Lynn Haven	Rains

Soil Productivity Group 51

This SPG is made up of excessively drained soils in the Atlantic Coast Flatwoods. The land capability class and subclass is IVs. Major soils are:

Chipley	Wagram
Lakeland	

APPENDIX 2
PROFIT MAXIMIZATION PLANNING MODELS

The linear programming planning models were also formulated to examine land use and production when the objective is to maximize profits given the availability of land and projected ranges of crop acreage and production levels to year 2000. The models were identical to those described in Appendix 1, except that the focus is on maximizing profits rather than minimizing costs of production. For some resource planning situations, results from the two sets of models could be comparable. When keeping the projected ranges on land use and production unchanged, the least profitable crops will be included at the lower limits of the ranges while the more profitable crops will usually be included at higher acreages than those for the cost minimization formulation. As a result, cropping patterns and levels of production can be quite different with profit maximization formulation when production in North and South Carolina is considered within the context of production in other states so to approach balancing supply and demand at the national level while minimizing costs of production. The latter is the point of departure for developing the OBERS projections of production and land use with disaggregations to individual state levels. Since the "future without" condition reflected the cost minimization approach[1/], this focus was given most consideration in this study.

Using profit maximizing formulations, cropland acreages for North and South Carolina are higher than acreages estimated with the cost minimization models. Increases in the cropland base for the Yadkin and Pee Dee portions are estimated at about three and five percent, respectively. Such increases are expected to result from additional conversions of woods to cropland. Also, within the cropland base, acreages in inactive uses are reduced considerably as these lands are shifted to active production.

The land treatments for improved drainage and for converting cropland to permanent vegetation where soil erosion is excessive were also analyzed in the profit maximization formulations. Changes in land use and net returns with the land treatments in comparison to without treatment conditions within a profit maximization formulation are discussed in the next two sections.

Water Management

With improved drainage on selected SPGs, acreages of major land uses are unchanged but some changes in cropping patterns within the cropland base result. For the Yadkin portion, estimated annual net returns increase by $5.6 million over the profit maximizing levels without improved drainage. The estimated increase for North Carolina is about $44.7 million. Corresponding increases in annual net returns, including forestry products for the Pee Dee portion and South Carolina are $5.9 million and $13.1 million, respectively.

1/ Report 1 (see front cover).

Erosion Control

The effects of "moderate" and "major" erosion control on land use and net returns were analyzed for North Carolina. Similar effects for "major" erosion control in South Carolina were estimated.

With a "moderate" erosion control program, the cropland base in the Yadkin portion and in North Carolina is reduced by about 8,700 acres and 63,000 acres, respectively. The conversion of planted cropland to permanent vegetation was partially offset by a shift of inactive cropland to active uses. The net loss within the planted cropland acreage resulted in declines of $0.4 million and $4.2 million in net returns for the Yarkin portion and North Carolina, respectively.

If a "major" control program were implemented, planted cropland in the Yadkin portion and North Carolina would be reduced by about 133,000 acres and 404,000 acres, respectively, in comparison to the profit maximizing levels without any additional erosion control. The corresponding reductions in net returns were estimated at $17.3 million and $52.1 million for the two areas, respectively.

In South Carolina, a "major" erosion control program would reduce the planted crop acreage by 25,000 acres and 159,000 acres for the Pee Dee portion and South Carolina, respectively. Estimated net returns to agriculture, including forestry would be reduced by $0.4 million and $3.7 million, respectively.


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ABBREVIATIONS USED IN THIS REPORT

ACP	Agricultural Conservation Program
ASCS	Agricultural Stabilization and Conservation Service
CFM	Cooperative Forest Management
CoE	U.S. Army Corps of Engineers
ED	Economic Development
EPA	Environmental Protection Agency
EQ	Environmental Quality
ESS	Economics and Statistics Service
FAC	Field Advisory Committee
FEMA	Federal Emergency Management Administration
FmHA	Farmers Home Administration
FIP	Forest Incentives Program
FS	Forest Service
F&WS	U.S. Fish and Wildlife Service
HUD	U.S. Department of Housing and Urban Development
LAP	Landowner Assistance Program
MLRA	Major Land Resource Area
NED	National Economic Development
OM&R	Operation, Maintenance and Replacement
PL-46	Soil Conservation Act (Public Law 74-46)
PL-566	Watershed Protection and Flood Prevention Act (Public Law 83-566)
ppm	parts per million
RC&D	Resource Conservation and Development
SEA	Science and Education Administration
SCS	Soil Conservation Service
SPG	Soil Productivity Group
TSI	Timber Stand Improvement
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey


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